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MATERIEL DEVELOPMENT AND READINESS COMMAND



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# MANUFACTURING METHODS & TECHNOLOGY

PROGRAM PLAN

CY 1982

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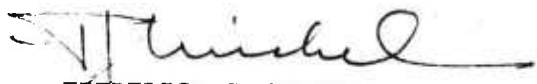
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SUBJECT: 1982 DARCOM MMT Program Plan

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1. Reference AR 700-90, Army Industrial Preparedness Program, para 3-4i(1), dated 15 March 1982.
2. This planning document, developed in accordance with the referenced regulation, describes the DARCOM Manufacturing Methods and Technology (MMT) Program for the period FY 82-86. This plan was completed by amending the 1981 Program Plan to take into account both programming actions which have occurred over the past year (i.e., FY 82 approvals, FY 83 apportionment submission, and FY 84 budget submission) and other Command inputs reflecting FY 85 ad 86 thrusts.
3. Because of the dynamic nature of military material requirements and the constant change in technology, the inclusion of a project in this plan is not a guarantee of funding. However, the plan does indicate the current technology needs and interests of the DARCOM community.
4. Additional copies of this document may be obtained by writing the Defense Technical Information Center, ATTN: DTIC-TSR-1, Cameron Station, Alexandria, VA, 22314.

1 Incl  
CY 1982 DARCOM  
MMT Program Plan

  
FREDERICK J. MICHEL  
Director  
Manufacturing Technology



## FOREWARD

This document presents information for the DARCOM Manufacturing Methods and Technology (MMT) Program for Fiscal Years 1982-1986. The projects and funding levels for the out-years are for planning purposes only and will change based on technological developments and revisions in program requirements. Since total funding for these planned projects exceeds the projected funds for the Army's MMT Program, some projects will not be funded or may be slipped to later fiscal years. HQ, DARCOM and its subcommands and centers have the authority to reprogram funds to projects with higher priority, thereby affording the flexibility to accommodate new opportunities as they arise.

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## INTRODUCTION

### The MMT Program Plan

The MMT Program Plan, CY 1982, provides within a single source a summary of current and near-term efforts (FY82-FY86) included in the DARCOM MMT Program. Since weapons systems requirements and the technology for these systems are constantly changing, inclusion in the Program Plan is not a guarantee that an individual project will be funded. However, the Plan does serve as an indicator of the areas towards which DARCOM's resources will be directed and the magnitude of the Army's commitment to this program.

### Organization of the MMT Program Plan

The Plan provides a section for each DARCOM element which has projects in the FY 82-86 period. Each section includes a summary of the activity, its responsibilities, and its major MMT thrust areas. Following this summary is a listing of each project proposed by that activity.

Individual project information is presented by the last four digits of the project number and includes the project title, funding, a brief description of the problem addressed by the project and the proposed solution. Projects are grouped according to broad categories and then further subdivided according to component. This arrangement points out major areas of emphasis and aids the identification of possible duplication of effort.

### Industry Guide

An Industry Guide (Appendix A) has been included to aid in the use of the plan. The section will help clarify the interrelationships between the appropriations, commands, and personnel involved in the DARCOM MMT Program.

## PROGRAM IMPACT

### The MMT Program

The Manufacturing Methods and Technology (MMT) Program serves the US Army Materiel Development and Readiness Command (DARCOM) as a bridge between research and development and production. The program's primary aim is to reduce the cost of weapons system acquisition by improving the efficiency of manufacturing processes and by implementing new technology. Although cost reduction is a primary concern, the emphasis is also directed toward efforts reducing air and water pollution, increasing safety, conserving energy, reducing dependency on critical material, improving producibility and increasing productivity.

### Need for MMT

The United States is currently in a period of low productivity growth resulting in increased product costs. The MMT Program is a major DOD tool to improve productivity and lower end item and spare/repair parts costs. The following excerpts illustrate the emphasis being given to the MMT Program by DOD and Department of Army.

Excerpt from the "Annual Report to the Congress, Fiscal Year 1983" by The Honorable Caspar W. Weinberger, Secretary of Defense:

"The Manufacturing Technology Program is a broad based program designed to improve the productivity and responsiveness of the U.S. industrial base. Investments made by this predominately procurement funded program have resulted in factory floor applications of productivity enhancing technology and will continue to receive priority emphasis."

Excerpt from "The Industrial Base of Defense," remarks delivered by the Honorable Frank C. Carlucci, Deputy Secretary of Defense to the National Security Industrial Association, 17 September 1981:

"The costs of producing the product are directly related to the quality of the manufacturing process. Industry has the prime responsibility for identifying and for implementing improvements to manufacturing technology, including full use of such processes as computer aided design and computer aided manufacturing, including robotics.

"Of paramount importance, is the quality and reliability of the product delivered. These are vital elements of an effective weapon system. Much has been written in recent months regarding the alleged inability of American industry to match the standards of its international competitors, especially the Japanese. This is all the more ironic, since the Japanese attributed much of their success to the use of American concepts and methodology for quality improvement. I can't imagine a more provocative challenge to U.S. industry than to demonstrate the ability to build the highest quality products, using the most efficient manufacturing technology.

"I, therefore, suggest that the industry leadership of this country establish a national commitment to improve the quality and reliability of its products, along with a dedication to improve our national productivity across-the-board."

Excerpt from "The FY 1983 Department of Defense Program for Research, Development and Acquisition" by the Honorable Richard D. DeLauer, Under Secretary of Defense, Research and Engineering to the 97th Congress, Second Session, 1982:

"The Technology Modernization (or Tech Mod) Program is a joint venture with industry wherein we invest in enabling manufacturing technologies and industry invests in capitalization for modernization of a factory, plant, facility, assembly line, etc. The approach involves a formal structured analysis of the manufacturing operation to be modernized followed by contractual agreements as to who will do what and the benefits sharing to result. The Tech Mod contract is linked to one or more acquisition contracts, providing the leverage, shared benefits, and contractor risk protection. The end result benefits all; industry is modernized through technology and capitalization, the government saves money on acquisition, industrial capacity/capability is increased, and industry reaps additional profits."

Excerpts from a Memorandum for the Secretaries of the Military Departments, 2 September 1981, subject: Manufacturing Technology Program, by the Honorable Richard D. DeLauer, Under Secretary of Defense, Research and Engineering:

"During the past several months, the Congress and the Department of Defense have had considerable dialogue concerning the health and vitality of the Defense industrial base. Numerous Congressional hearings have brought focus to the fact that our industrial base must be strengthened if we are to continue to provide a strong national defense. Secretary Weinberger has been personally involved in these discussions and has provided guidance on initiatives he would like undertaken. Last April, Deputy Secretary Carlucci issued a major policy statement on "improving the Acquisition Process" which addresses many industrial base issues. One important recommendation points out that a major cause for lagging Defense industrial base productivity is the low level of capital investment compared to U.S. manufacturing in general. I want to reverse this trend. . .

"The Manufacturing Technology Program has been and continues to be a very sound investment. Its basic purpose is to reduce materiel acquisition costs and lead times by providing the advanced manufacturing technology necessary to improve industrial base productivity in those situations where the private sector is unable or unwilling to do so . . ."

"First, the Manufacturing Technology Program needs your continued financial support. During the past five years (FY 1978-1982) DoD budgeted \$740 million for new manufacturing technology. Our current plans call for more than doubling that during the next five years. We should view this as a minimum funding level and actively seek to identify where increases are needed in order to provide a more productive and responsive industrial base. There are several areas (e.g., shipbuilding and tracked combat vehicles) which have a high potential payback for key investments in modern, more productive manufacturing technology.

"Second, I believe the Manufacturing Technology Program needs your continued attention to assure that these investments are based on sound business practices. Investment in advanced manufacturing technology should result in improved factory floor productivity. We need strong leadership and effective managers which assure that these investments reduce weapons systems costs. We must also document the benefits achieved to permit us to monitor our own performance and to demonstrate to the taxpayers the soundness of the program.

"I ask you to join me in pursuing the overall goal of improving the strength and vitality of the Defense Industrial base. I believe we will be better able to do so if we have a strong Manufacturing Technology Program and supporting organizational structure . . ."

Excerpt from a Memorandum for Deputy Chief of Staff for Research, Development, and Acquisition, 31 December 1981, subject: Manufacturing Technology Program by The Honorable J. R. Sculley, Assistant Secretary of the Army (Research, Development and Acquisition):

"I fully support the Manufacturing Technology Program and request your continuing personal support and attention in two major areas.

"First, investments in the Manufacturing Technology Program need increased emphasis in the budget formulation process to ensure increased paybacks of future production procurements. Since 1979, Manufacturing Technology investments have been considerably less than one percent of the procurement budget. While recognizing that a percentage of the procurement budget is an arbitrary measure, I request your support in achieving a full 1.0 percent of the budget in the POM 84-88 formulation process, especially for high cost major weapons systems.

Second, investments in the Industrial Productivity Improvement Program are sound and require emphasis and funding. The thrust is somewhat different from Manufacturing Technology, but the goal of increased productivity is the same. This program is the specific Army action resulting from Acquisition Initiative #5. I also request your support for this program in the POM 84-88 formulation process with special emphasis for support in the early years.



"I believe selected investments in the Productivity Improvement Program at key plants, combined with an increased emphasis on the more generic Manufacturing Technology Program addressed above, will have enormous paybacks in future acquisition costs, as well as providing a more responsive industrial base. Prior budgetary decisions have been influenced greatly by operational readiness issues. With your help, the two areas addressed above will provide the avenue by which investment/industrial base considerations will be able to compete on a more equitable basis."

### New Systems

The MMT program is necessary to support the production base being established for the new weapons systems required to modernize our forces and improve our readiness in the 1980's. These new systems will perform a variety of offensive and defensive missions, from the national command center to the forward edge of the battlefield. They run the gamut from mundane tools for digging foxholes to sophisticated information systems which coordinate the identification and destruction of hostile forces. New guns, ammunition, vehicles, missiles, aircraft, and communications equipment are included. Two new fighting vehicles, the M2 and M3 Bradleys, are beginning to roll off the assembly lines. The M2 Bradley is a personnel carrier and weapons platform for the motorized infantry. The M3 Bradley will keep pace with the highly mobile M1 Abrams Tank and will suppress the anti-armor threat from opposing infantry forces. In addition, the DIVAD Gun System, now in early production stages, will give us better low altitude air defenses. A new attack helicopter, the Apache, armed with Hellfire missiles will devastate hardened targets. Our infantry, equipped with improved TOW and Viper missiles, and our artillery batteries, equipped with Copperhead and SADARM munitions, will achieve new armor defeating capabilities.

In the area of air defense, the Division Air Defense (DIVAD) Gun System will replace the 20mm Vulcan. DIVAD is a radar directed automatic gun system for the defense of the Abrams Tank, the Bradley Fighting Vehicles, and forward maneuver battalions. Mounted on a modified M48A5 tank chassis, the DIVAD system includes NATO standard Bofors L/70 40mm guns, ammunition which is loaded by a linkless feed system, and Westinghouse F-16 derived search and track radar. DIVAD embodies reasonable balances between system performance, reliability, and cost. Electronic component reliability is expected to be much superior to that of older systems. Use of integrated circuits instead of discrete components, digital instead of analog computers, and improved manufacturing and inspection processes are examples of these advances. Development has been completed and deployment of the Roland and Patriot missile systems is underway. Roland is a French/German all weather short range surface to air system adopted by the Army. Patriot is the replacement for NIKE-Hercules and Improved Hawk to provide low and medium altitude air defense.

In the area of aircraft, the Army Helicopter Improvement Program (AHIP) is developing an advanced version of Scout helicopter to provide



intelligence, surveillance, and target acquisition support. The Scout will have laser designation capability to assist our attack helicopters and our field artillery in guiding munitions to their targets. This program is looking at the OH-6 and OH-58 as candidates for an interim Scout helicopter. Following the AHIP Program, if cost justifiable, the design of a new airframe specifically suited for the Scout mission will be pursued. Also, a remotely piloted vehicle is currently being developed to provide surveillance and target designation behind enemy lines. The Apache Attack Helicopter, now in transition from R&D to production, will possess immense survivability. The rotary dynamic components can tolerate Soviet 23mm anti-aircraft fire. This aircraft can operate at nap-of-the-earth altitudes at night with the aid of an advanced pilot's night vision system. During the hours of darkness or in adverse weather, the gunner's sights can pinpoint long range targets for the on-board Hellfire Missiles. A fire-and-forget seeker that locks on target before missile launch is under development for the Hellfire. The seeker will allow the pilot to take immediate evasive action after missile launch. At present, the pilot must keep the target in sight while the gunner designates it by laser light until the missile strikes. He becomes vulnerable to return fire, unless laser designation tasks are assumed by another aircraft or a man on the ground. Soviet helicopters have the ability to attack ours over the battlefield. The Stinger, a shoulder fired air defense missile that homes in on engine heat, will be adopted for air-to-air use thus providing our crewmen with an additional measure of self protection.

New artillery weapons, including the helicopter transportable 155mm M198 Howitzer and the Multiple Launch Rocket System (MLRS), are being deployed. MLRS is a free flight artillery rocket system consisting of a 12 round launcher mounted on a highly mobile tracked vehicle. Its rockets can be fired one at a time or in rapid ripples. The Army is just beginning to procure anti-tank mines that are fired from the 155 Howitzer. Each round of ammunition dispenses nine mines onto the enemy's path. They are relatively small mines, but they will cause a mobility kill on a tank. Another intriguing submunition development for the standard 8 inch Howitzer is called SADARM (Sense and Destroy Armor). Over the target area, the projectile dispenses a submunition that descends by parachute. As the submunition rotates, its millimeter wave sensor scans the ground for an armored target and fuzes what is called a self forming fragment. The warhead actually forms a metallic slug which is projected at very high velocity into the thinly armored top of target.

The infantry is now receiving the 60mm Lightweight Company Mortar System (LWCMS), the first new mortar in 25 years. It consists of the M224 Mortar and a family of ammunition for indirect fire. The M224 has a range of 3500 meters, nearly twice that of its predecessor, and has a much higher rate of fire. For the defense of the infantryman, the Viper Rocket is under development. Like its predecessor, the LAW, this rocket is contained in a fiberglass tube which has a very simple sighting system.

Bridges have been critical to mobility from the time of the first armies. An assault bridge, capable of supporting 70 tons, is being

developed for the Army's heavy combat divisions. The bridge will be 31 meters long and will be transported and launched by M1 Tank chassis in 5 to 10 minutes. The bridge will incorporate composite materials to minimize its weight. Another new combat engineering item approaching production is the M9 Armored Combat Earthmover (ACE). This versatile vehicle is a combination dozer, scraper, dumper, grader, cargo carrier, and prime mover. One of its most important capabilities involves the excavation of protective fighting positions for tanks and other combat vehicles. Other combat support items that will increase survivability include fox hole diggers, fox hole covers, shelters for weapons and equipment, mobile well drilling equipment, waste water reuse equipment, and rapidly emplaced water storage bladders.

In response to the signatures, signals, and physical indicators that the enemy presents, the world of electronic warfare is ever-expanding. The components of these systems stretch back from the front lines to the national command authorities. Unattended sensors and night vision devices locate enemy movements at the front. In the air, the Stand-Off Target Acquisition System (SOTAS) mounted on a Blackhawk helicopter will radar detect and pinpoint moving ground targets which are miles behind enemy lines, from relatively safe positions behind our lines. The Army is fielding its firefighter radar systems which detect incoming mortar, artillery, and free rockets, and provide instant target data on point of origin before the rounds hit.

The reader may have noted that nearly every weapons system that the Army is planning and bringing to development, in some way, employs microcomputers and microelectronics. Our challenge is to harness the capabilities of the industrial base and to efficiently use the technology to give us cheaper and more capable subsystems.

### MMT Thrusts

The thrusts of the program are divided into two categories. The first category - Program Thrusts - is aimed at improving the overall management of the program. It is aimed at getting the most out of the program, both for Army and the industrial base, per dollar expended. The second category - Technology Thrusts - is aimed at the technical areas important to fielding the weapons systems of the 1980's.

#### Program Thrusts

- Support Procurement
- Improve Implementation
- Identify Cost Drivers
- Apply Foreign Technology
- Improve Technology Transfer

### Technology Thrusts

Large Scale Integration (LSI)	Flexible Machining Systems
Very High Speed Integrated Circuits (VHSI)	Group Technology
Gradient Index Optics	Computer Aided Design and Manufacturing
Silicon on Sapphire (SOS)	Computer Integrated Manufacturing
Fiber Optics	Robotics
Pressed Lenses	Laser Applications
Plastic Optics	Materials Substitution
Chalcogenide Glass Optics	Near Net Shape Processing
High Frequency Gallium Arsenide	Surface Treatment
Microwave Integrated Circuits	Joining-Automated Control
Composites	Ceramics
Air and Water Pollution Abatement	Metal Removal
Energy Conservation	High Speed Machining
Recycling	Powder Metallurgy
Demilitarization	Safety
Flexible Ammo Metal Parts Lines	Ammunition Cast and Press Loading
Automated Material Handling	Automated Test and Inspection

### Planning Synopsis

Expenditures planned by the DARCOM Major Subordinate Commands exceed \$705 million during the five year period. Starting at approximately \$90 million in FY82, the annual funding level more than doubles at the end of the period.

The Army MMT Program is controlled by a standard accounting system which contains eight different appropriations. In some cases, several of the commands share an appropriation. For example, the Communications/Electronics appropriation is used by three commands: CECOM, DESCOM, and ERADCOM. The distribution of the appropriations among commands is shown in the first table that follows and the level of planned expenditures within each appropriation is illustrated by the second table.

The third table offers a critique of planning process by showing the ratio of projects that were included in previous years' Program Plans to those projects that are currently in the FY83 Apportionment and FY84 Budget review cycles.

SUBMACOM SUBMISSION TO MMT PROGRAM  
BY COMMAND (Thousands of Dollars)

<u>Command</u>	<u>Appropriation</u>	<u>Fiscal Code</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>
ARRADCOM/ARRCOM	Ammunition	4250	24555	23052	26438	34110	54544
	Weapons	3297	9974	7275	12266	19955	15721
	Other Support	5397	3250	5634	3995	4604	1600
AVRADCOM	Aircraft	1497	12534	9610	26845	51140	52965
CECOM	Communications/Electronics	5297	2270	3070	9627	4750	0
DESCOM	Tracked Combat Vehicles	3197	1073	3448	2278	1650	500
	Tactical & Support Vehicles	5197	65	625	525	0	0
	Communications/Electronics	5297	0	420	176	0	0
ERADCOM	Communications/Electronics	5297	4561	12030	6705	14663	16456
DARCOM/AMMRC	Other Support	5397	5405	5211	6220	6250	6600
MICOM	Missiles	2597	8470	9700	14875	21073	23898
	Other Support	5397	150	600	800	900	1000
MERADCOM	Other Support	5397	0	315	1361	3717	2709
TACOM	Tracked Combat Vehicles	3197	13294	26176	15232	15158	5765
	Tactical & Support Vehicles	5197	467	2175	1595	2545	1305
TECOM	Other Support	5397	482	1200	1400	1500	1600
TSARCOM	Aircraft	1497	3486	8300	0	0	0

This table shows the planned expenditures for each fiscal year in the planning period. The "Command" Column identifies the DARCOM Major Subordinate Commands and Activities which participate in the MMT Program.

SUBMACOM SUBMISSION TO MMT PROGRAM  
BY APPROPRIATION (Thousands of Dollars)

<u>Appropriation</u>	<u>Fiscal Code</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>
Aircraft	1497	16020	17910	26845	51140	52965
Missiles	2597	8470	9700	14875	21073	23898
Tracked Combat Vehicles	3197	14367	29624	17510	16808	6265
Weapons and Other Combat Vehicles	3297	9974	7275	12266	19955	15721
Ammunition	4250	24555	23052	26438	34110	54544
Tactical and Support Vehicles	5197	532	2800	2120	2545	1305
Communications/Electronics	5297	6831	15520	16508	19413	16456
Other Support Equipment	5397	<u>9286</u>	<u>12960</u>	<u>13776</u>	<u>16971</u>	<u>13509</u>
TOTALS		90035	118841	130338	182015	184663

This table shows the planned expenditures for each fiscal year in the planning period. The "Appropriation" column identifies the various Procurement Appropriations established by the US Congress as a standard accounting system.

# ANALYSIS OF PREVIOUS PLANNING DATA

<u>CY of Plan</u>	<u>Period Covered*</u>	<u>Percent of Submission Previously Planned</u>	
		<u>FY83 Apportionment</u>	<u>FY84 BUDGET</u>
1977	FY79 - FY83	15.4%	9.0%
1978	FY80 - FY84	20.7%	11.2%
1979	FY79 - FY83*	24.2%	14.6%
1980	FY80 - FY84	55.6%	32.2%
1981	FY81 - FY85	79.3%	46.4%

This table shows the percentage of projects that are currently in the fiscal review cycles and that were planned in previous years' long range plans. It illustrates the improved planning accuracy that naturally occurs as the planning process and the budgeting process converge.

\*Starting in 1979, the planning period covered was changed to reflect the more immediate future, rather than the POM years.



## Factory Modernization Efforts

The MMT Program now incorporates broad based efforts directed toward the improvement of the manufacturing efficiency of an entire facility. The underlying strategy of these efforts is to increase contractors' motivation to maximize manufacturing efficiency. The objective is to achieve actual reductions in the cost of the end items procured by the Army.

Each effort will establish a thorough understanding of what steps need to be taken to improve productivity in a given plant and will identify incentives to insure contractor implementation of high priority opportunities. The effort will operate in three phases:

1. Phase I will be a thorough analysis of all aspects of a specific plant to obtain:
  - a. An understanding of the existing manufacturing systems.
  - b. A description of the most effective manufacturing system that could be developed in the plant.
  - c. A prioritized listing of what has to happen to get from the existing system to the most desirable one.
  - d. A proposal to the Army that identifies commitments required by both the contractor and the Army to implement the high priority productivity improvement opportunities.
2. Phase II will be initiated after the negotiation of the Phase I proposal and will develop individual manufacturing technologies necessary to achieve the desirable manufacturing system.
3. Phase III (primarily funded by the contractor) will be the phase that implements the manufacturing technologies developed under Phase II and the other scheduled improvements agreed to during the negotiations that followed Phase I.

The Army's initial factory modernization effort started in the middle of 1981 at the AVCO Corporation, Lycoming Division in Stratford, CT. This plant produces turbine engines for helicopters and the M1 Abrams Tank. A major part of the negotiations at the end of Phase I was deciding which elements of the plant modernization would be undertaken first, and how the resulting savings would be shared between the Army and Lycoming. Phase II at Stratford is just beginning.

The following tables and chart illustrate the size and direction of all factory modernization efforts during the planning period.



The first table highlights the portion of the planned program specified for factory modernization. Parenthetical entries denote the value of these efforts in comparison to the entire MMT Program. The scope of effort and the level of planned expenditures are significant in the aircraft production base.

The sixteen modernization efforts that contribute to the data included in the first table are detailed in the second table. Additional descriptions for the efforts may be found in Section III, Command Plans, under the category called "Factory Modernization."

The bar charts illustrate the tabular funding data graphically. Here, the total planned MMT Program and the planned factory modernization efforts are compared with funding guidelines established by the Five Year Defense Plan (FYDP) Procurement Annex, FY83 President's Budget, dated February 1982. As can be seen in the charts for the Aircraft, Tracked Combat Vehicles, and Communications/Electronics appropriations, hard decisions will have to be made in allocating funds between Factory Modernization MMT and generic MMT if the overall funding guidelines are to remain unchanged.

FACTORY MODERNIZATION FUNDING  
BY APPROPRIATION (Thousands of Dollars)

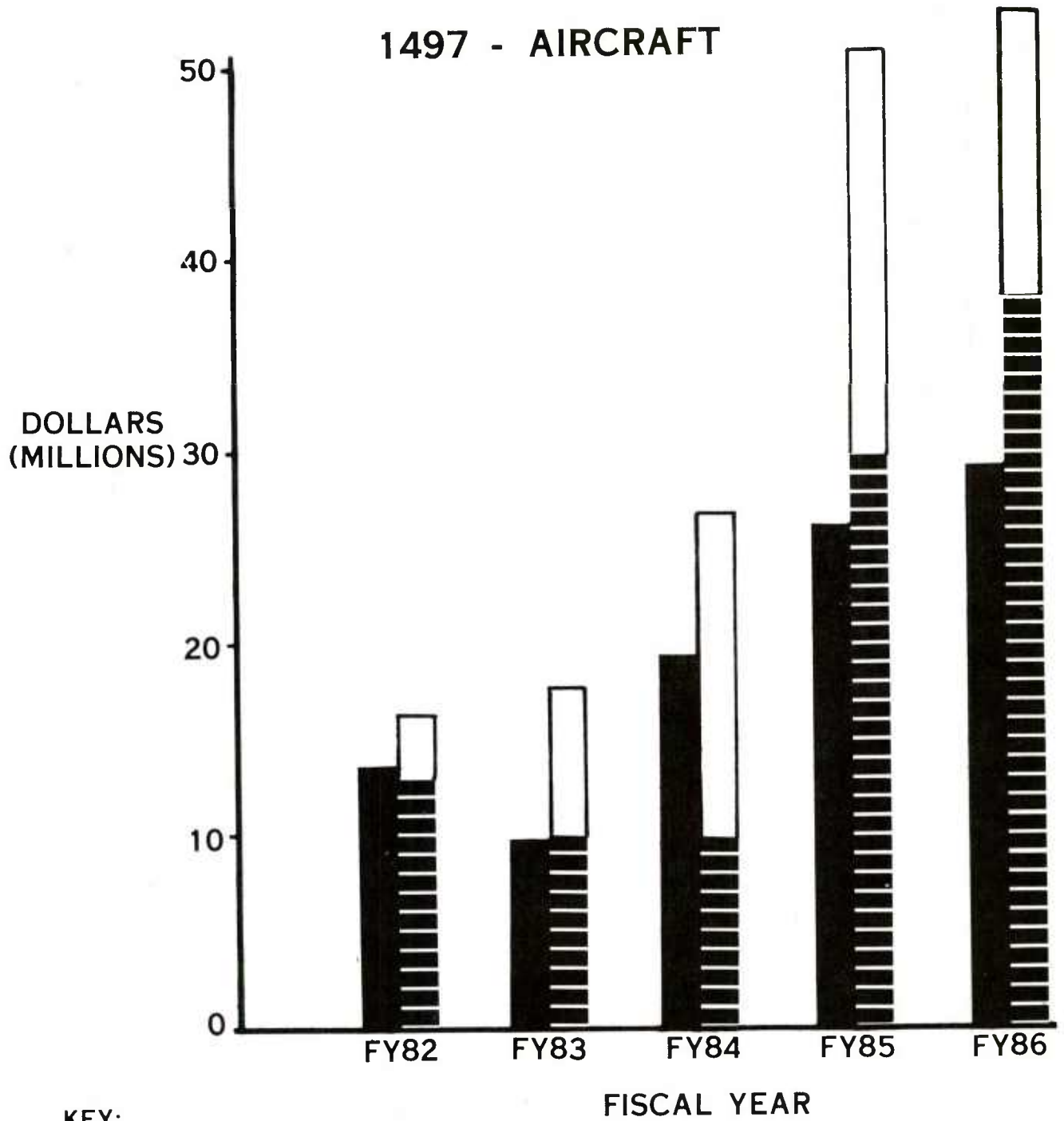
Appropriation	Fiscal Code	Command	FY 82	FY 83	FY 84	FY 85	FY 86
Aircraft	1497	AVRADCOM	12534 (110)	9610	26845 (17000)	51140 (21500)	52965 (15000)
		TSARCOM	3486 (3000)	8300 (8300)			
		TOTALS	16020 (3110)	17910 (8300)	26845 (17000)	51140 (21500)	52965 (15000)
Missiles	2597	MICOM	8470 (1800)	9700 (3840)	14875 (2200)	21073	23898
Tracked Combat Vehicles	3197	DESCOM	1073 (200)	3448 (2600)	2278 (1400)	1650 (500)	500 (500)
		TACOM	13294	26176 (3200)	15232 (500)	15158 (200)	5765 (200)
		TOTALS	14367 (200)	29624 (5800)	17510 (1900)	16808 (700)	6265 (700)
Tactical and Support Vehicles	5197	DESCOM	65	625	525		
		TACOM	467 (100)	2175 (1500)	1595 (1000)	2545	1305
		TOTALS	532 (100)	2800 (1500)	2120 (1000)	2545	1305
Communications/Electronics	5297	CECOM	2270	3070 (2000)	9627 (3027)	4750	
		DESCOM		420	176		
		ERADCOM	4561	12030	6705 (1500)	14663	16456
		TOTALS	6831	15520 (2000)	16508 (4527)	19413	16456

NOTE: The factory modernization share in the MMT Program is shown in parentheses.

PLANNED FACTORY MODERNIZATION EFFORTS  
82/09/01.

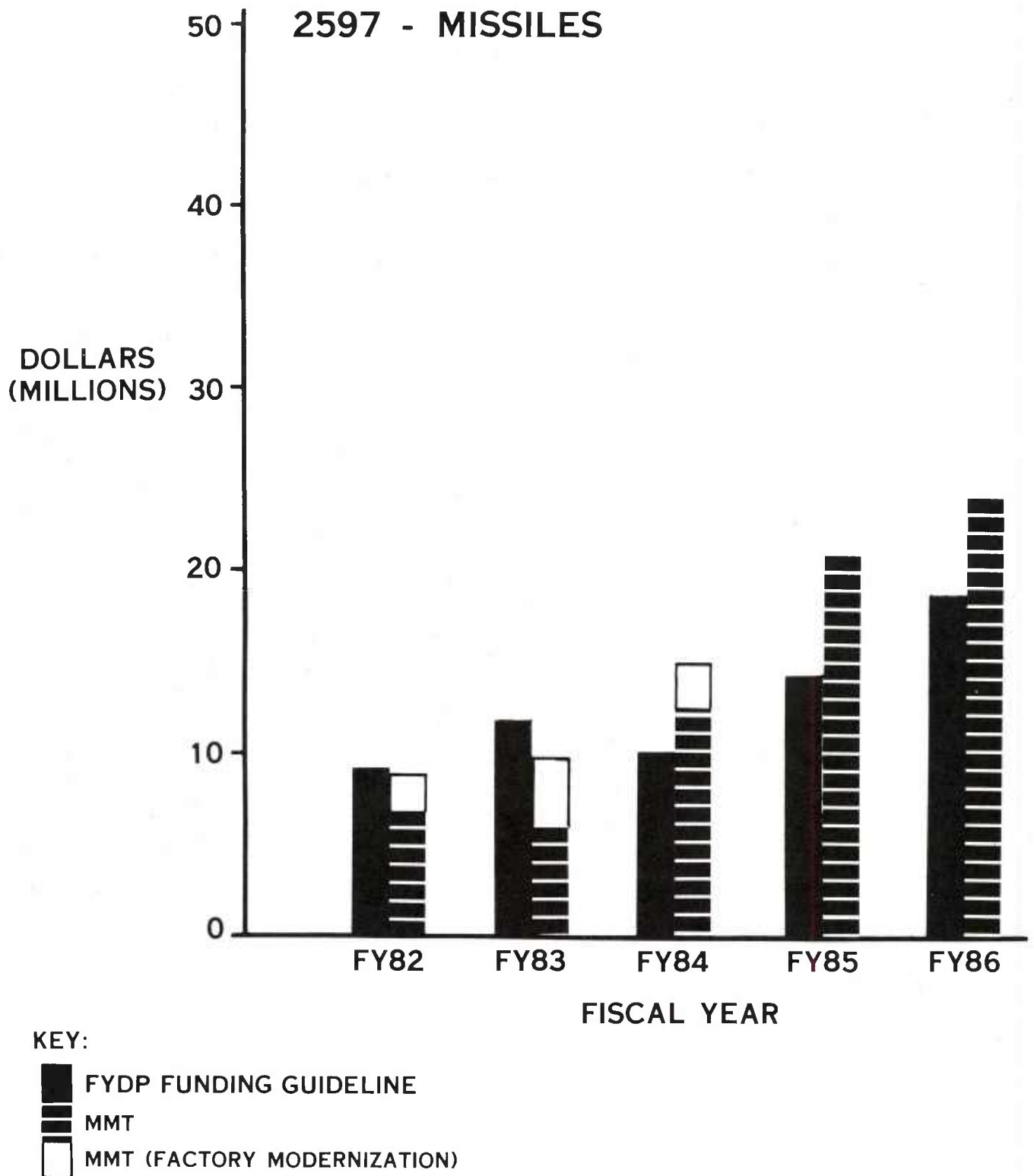
COMMAND	PROJECT NO	FY	COST	PROJECT TITLE
***				
* AVRADCOM	7426	82	110	AIRCRAFT ELECTRONICS MFG PRODUCTIVITY IMPROVEMENT PROGRAM
*		84	2500	
*		85	3000	
*		86	2000	
* AVRADCOM	7427	84	3000	ATTACK HELICOPTER PRODUCTIVITY IMPROVEMENT (API) PROGRAM
*		85	3500	
*		86	3000	
* AVRADCOM	7428	84	2500	IPI PROGRAM - AVCO LYCOMING - TURBINE ENGINES
*		85	3000	
*		86	2000	
* AVRADCOM	7429	84	2500	IPI PROGRAM - SIKORSKY AIRCRAFT - UH-60 BLACKHAWK
*		85	3000	
*		86	2000	
* AVRADCOM	7433	84	2000	IPI PROGRAM - BELL HELICOPTER TEXTRON INC - AHIP
*		85	3000	
*		86	2000	
* AVRADCOM	7442	84	2000	IPI PROGRAM - BOEING VERTOL INC - CH-47D HELICOPTER
*		85	3000	
*		86	2000	
* AVRADCOM	7449	84	2500	IPI PROGRAM - LOCKHEED MISSILES + SPACE CO -RPV
*		85	3000	
*		86	2000	
* CECOM	3094	83	2000	COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS
*		84	3027	
* DESCOM	2002	82	100	LONG RANGE DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM - LEAD
*		83	1400	
*		84	1400	
*		85	500	
*		86	500	
* DESCOM	8001	82	100	ANNISTON PRODUCTIVITY IMPROVEMENT PROGRAM (PHASE I)
*		83	1200	
* ERADCOM	5196	84	1500	INDUSTRIAL PRODUCTIVITY IMPROVEMENT (ELECTRONICS)
* MICON	1121	82	1800	MISSILE MANUFACTURING PRODUCTIVITY IMPROVED PROGRAM
*		83	3840	
*		84	2200	
* TACOM	6089	83	1500	ABRAMS TANK PRODUCTIVITY IMPROVEMENT (PHASE I)
* TACOM	6090	82	100	TODELE ARMY DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM
*		83	1500	
*		84	1000	
* TACOM	6095	83	1700	ABRAMS TRANSMISSION PRODUCTIVITY IMPROVEMENTS
*		84	500	
*		85	200	
*		86	200	
* TSARCOM	8192	82	3000	TURBINE ENGINE PRODUCTIVITY IMPROVEMENT
*		83	8300	

# 1497 - AIRCRAFT

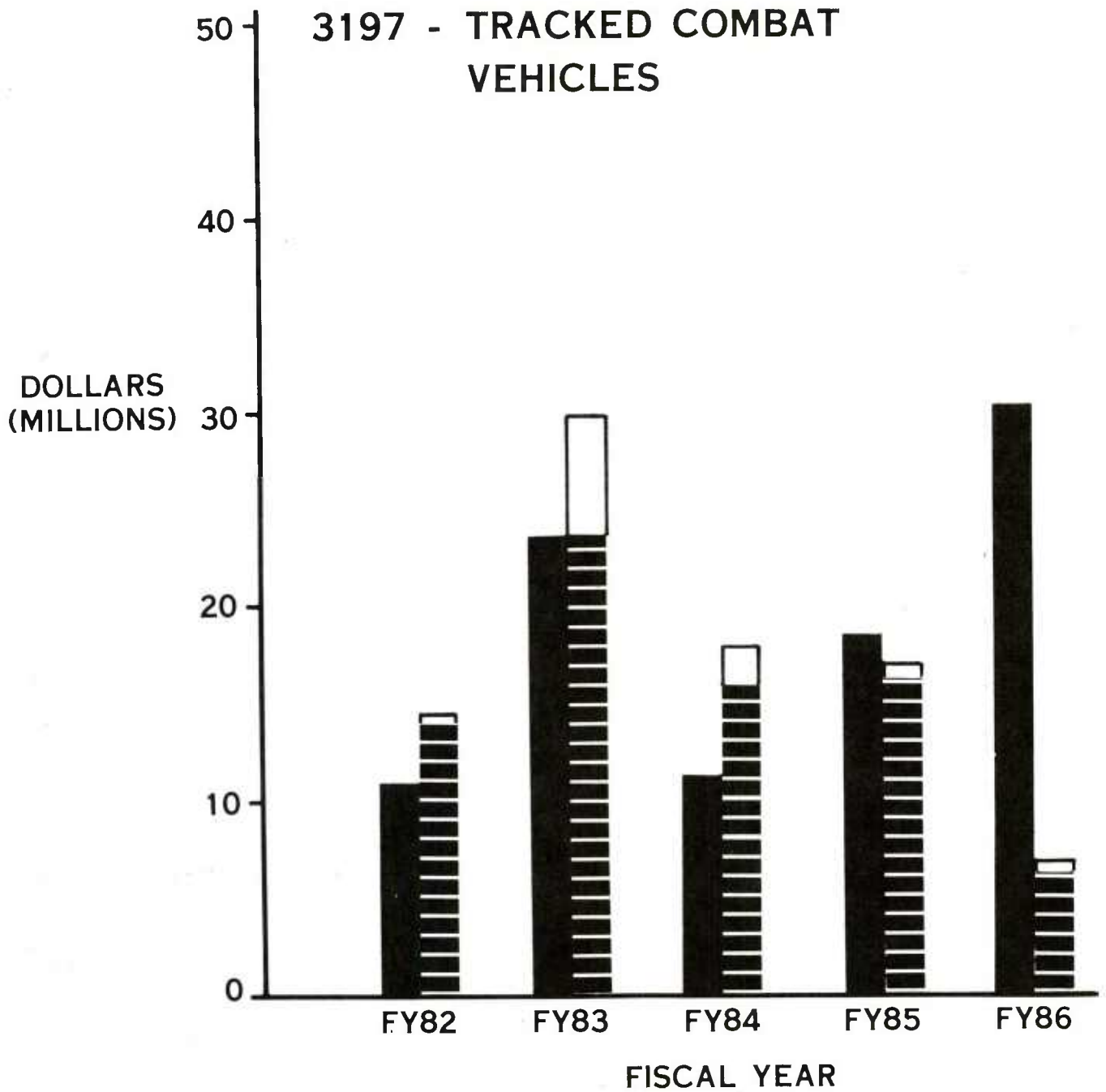


KEY:

- FYDP FUNDING GUIDELINE
- MMT
- MMT (FACTORY MODERNIZATION)

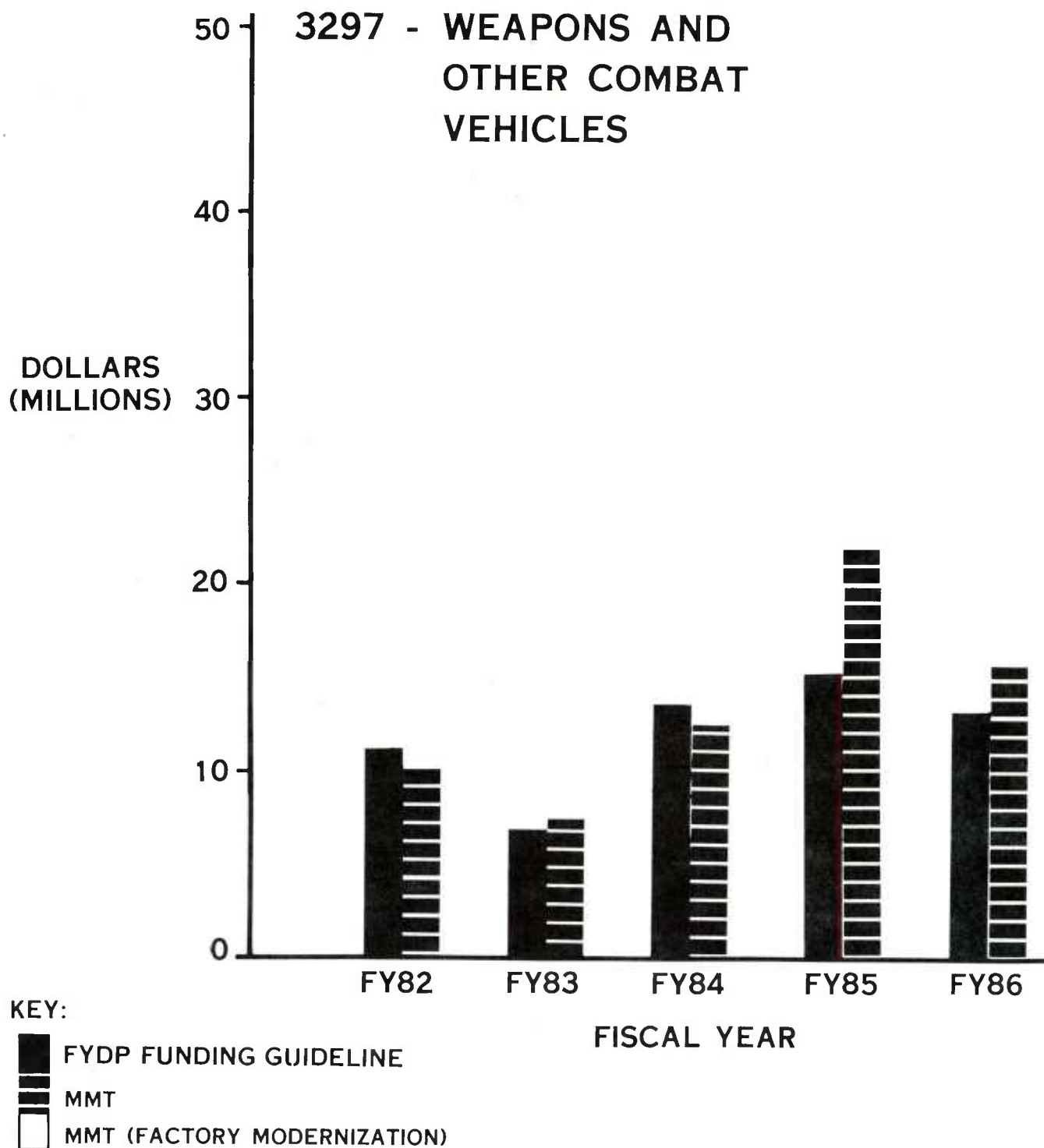


# 3197 - TRACKED COMBAT VEHICLES



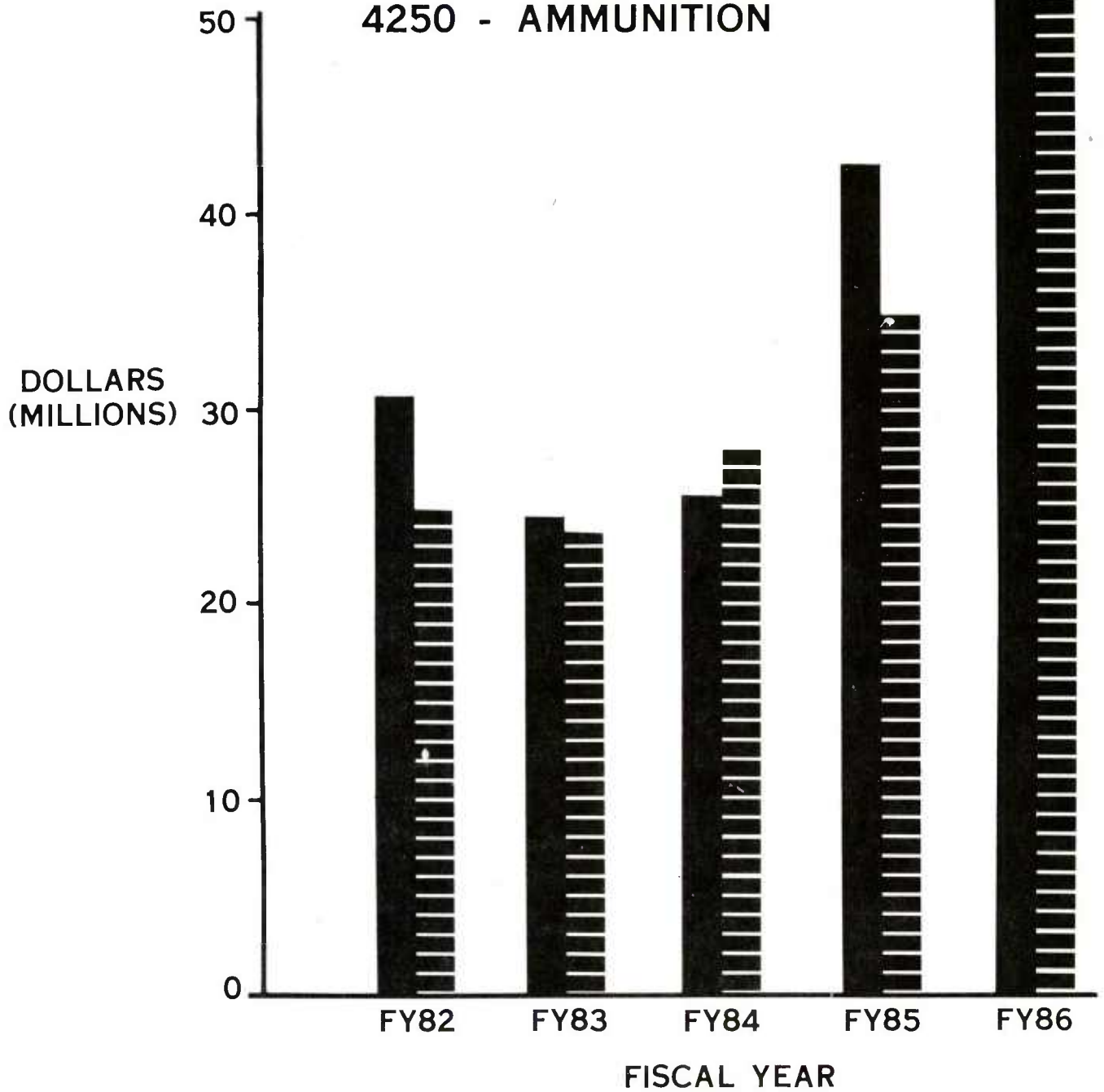
KEY:

- FYDP FUNDING GUIDELINE
- MMT
- MMT (FACTORY MODERNIZATION)





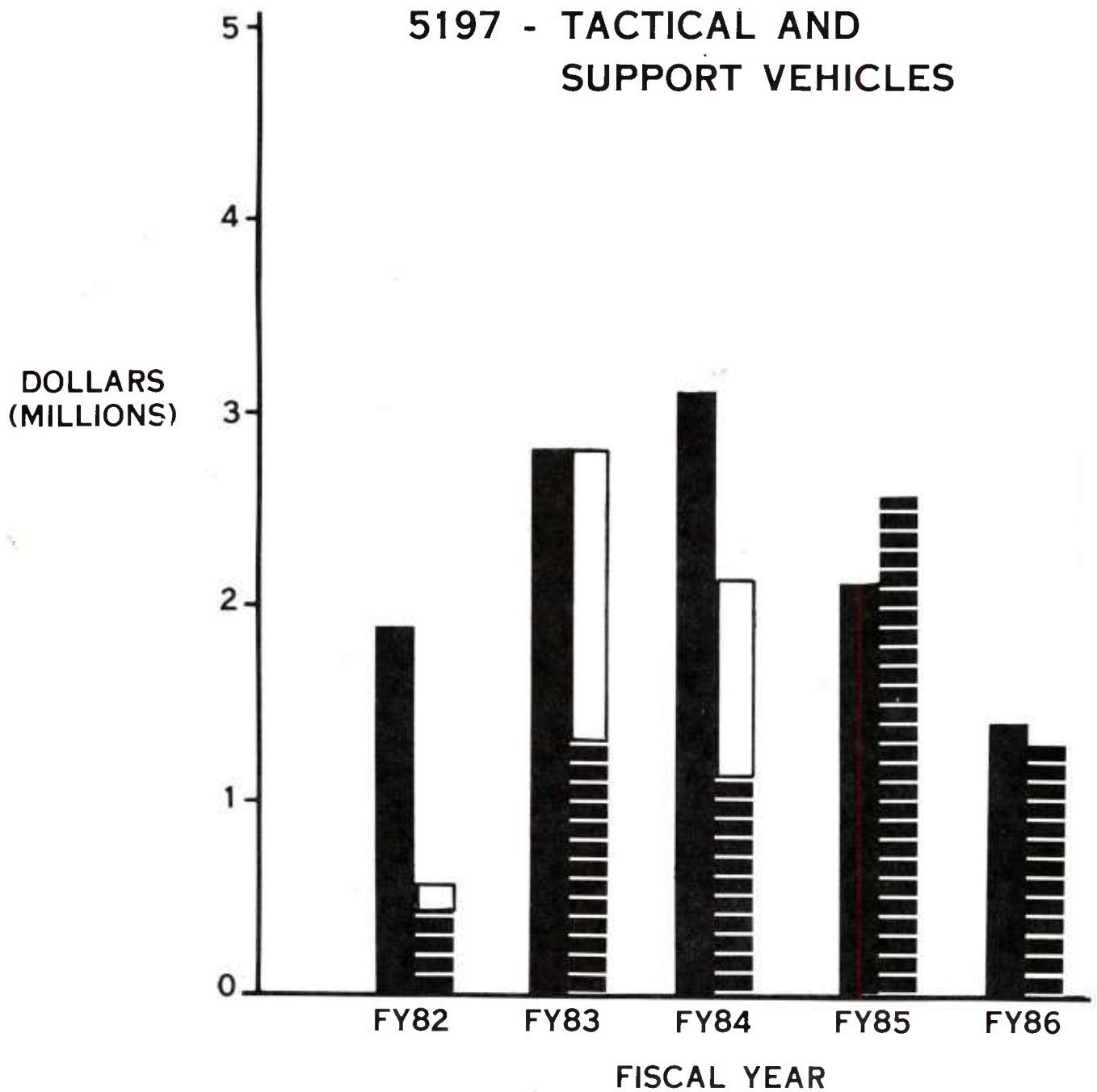
# 4250 - AMMUNITION



KEY:

- FYDP FUNDING GUIDELINE
- MMT
- MMT (FACTORY MODERNIZATION)

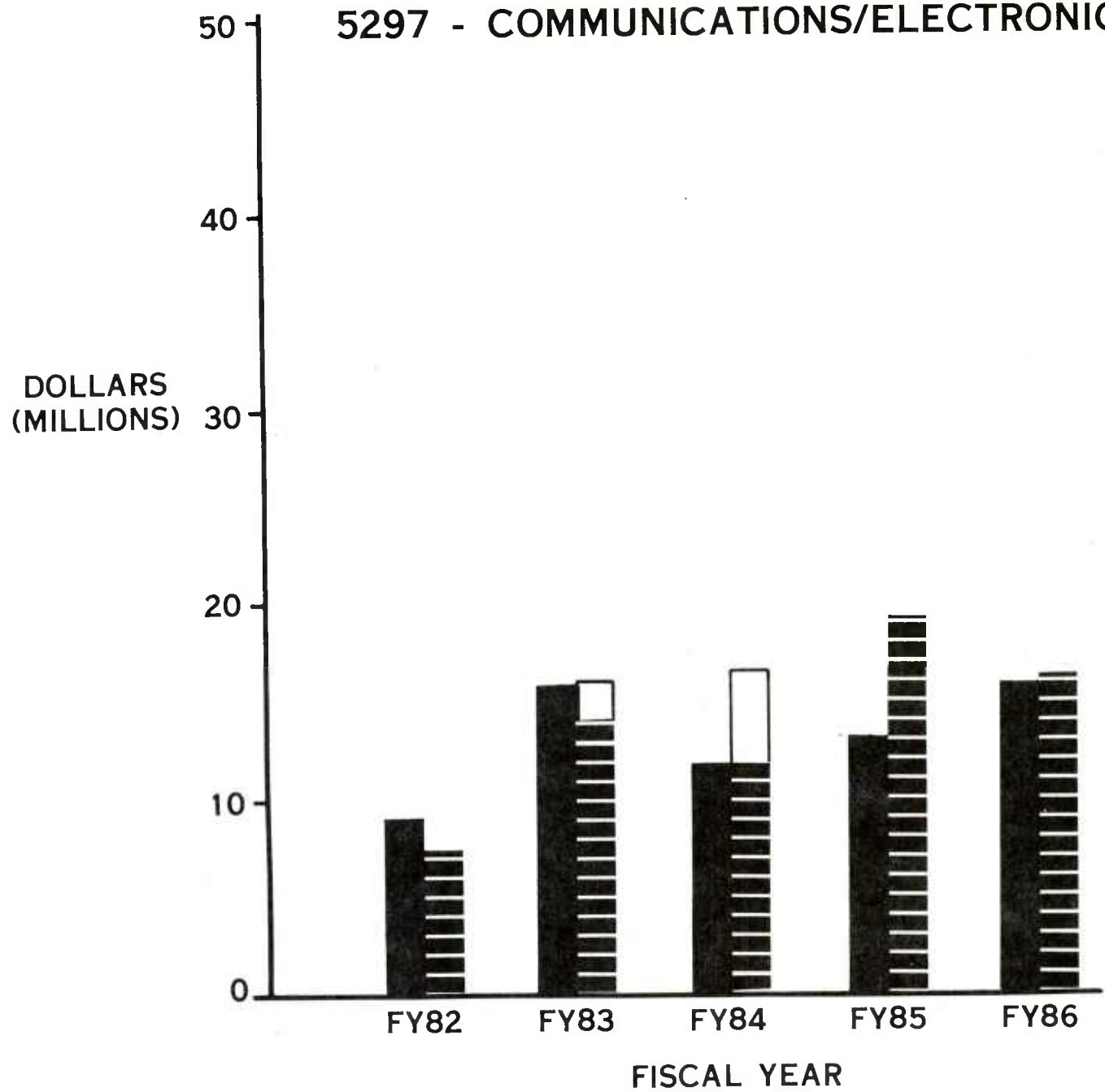
# 5197 - TACTICAL AND SUPPORT VEHICLES



KEY:

- FYDP FUNDING GUIDELINE
- MMT
- MMT (FACTORY MODERNIZATION)

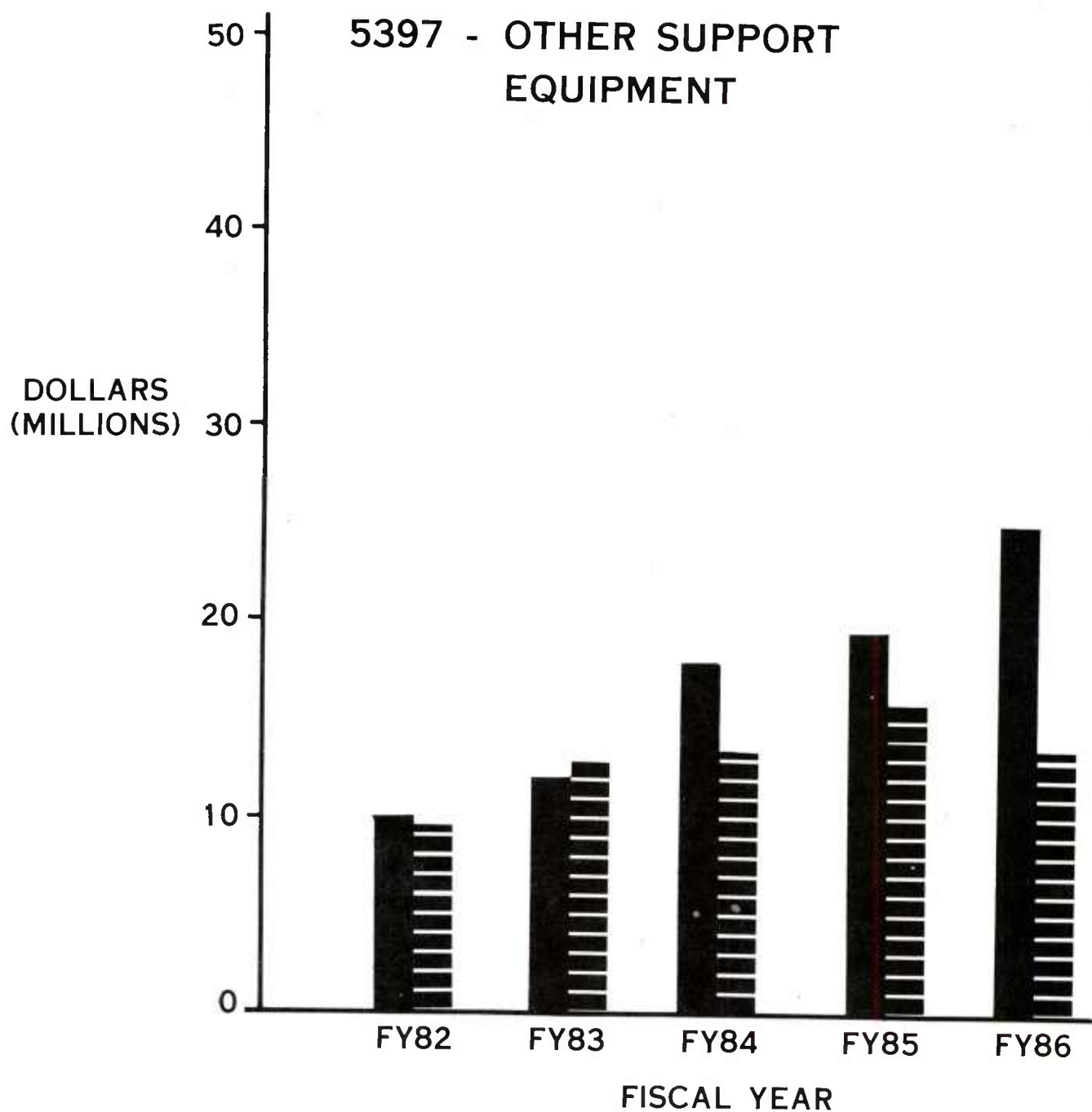
# 5297 - COMMUNICATIONS/ELECTRONICS



KEY:

- FYDP FUNDING GUIDELINE
- MMT
- MMT (FACTORY MODERNIZATION)

# 5397 - OTHER SUPPORT EQUIPMENT



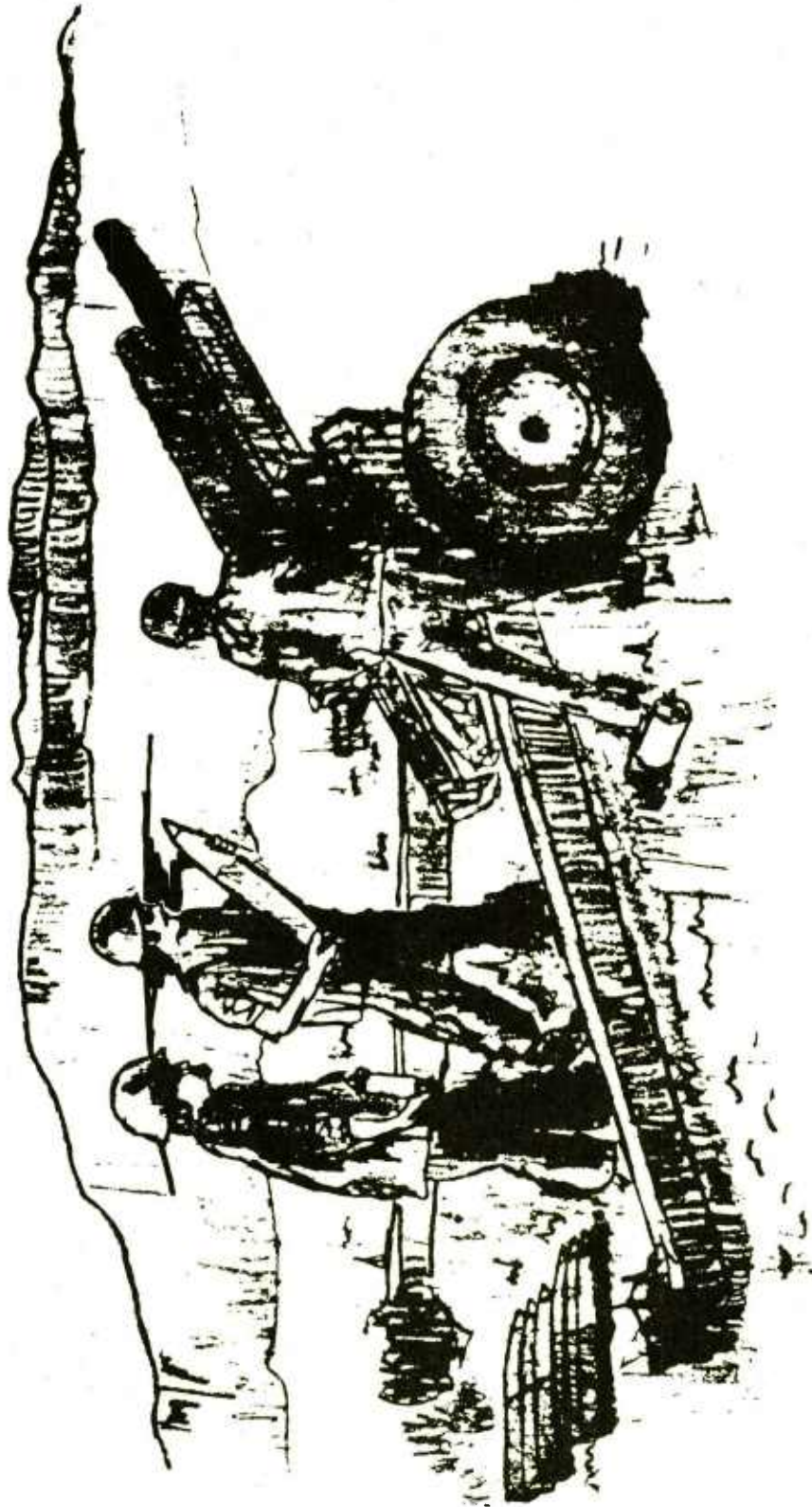
KEY:



FYDP FUNDING GUIDELINE

MMT

MMT (FACTORY MODERNIZATION)



**ARMAMENT R&D COMMAND  
(ARRADCOM)**

**ARMAMENT MATERIEL READINESS COMMAND  
(ARRCOM)**

US ARMY ARMAMENT MATERIEL READINESS COMMAND (ARRCOM)

AND

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND (ARRADCOM)

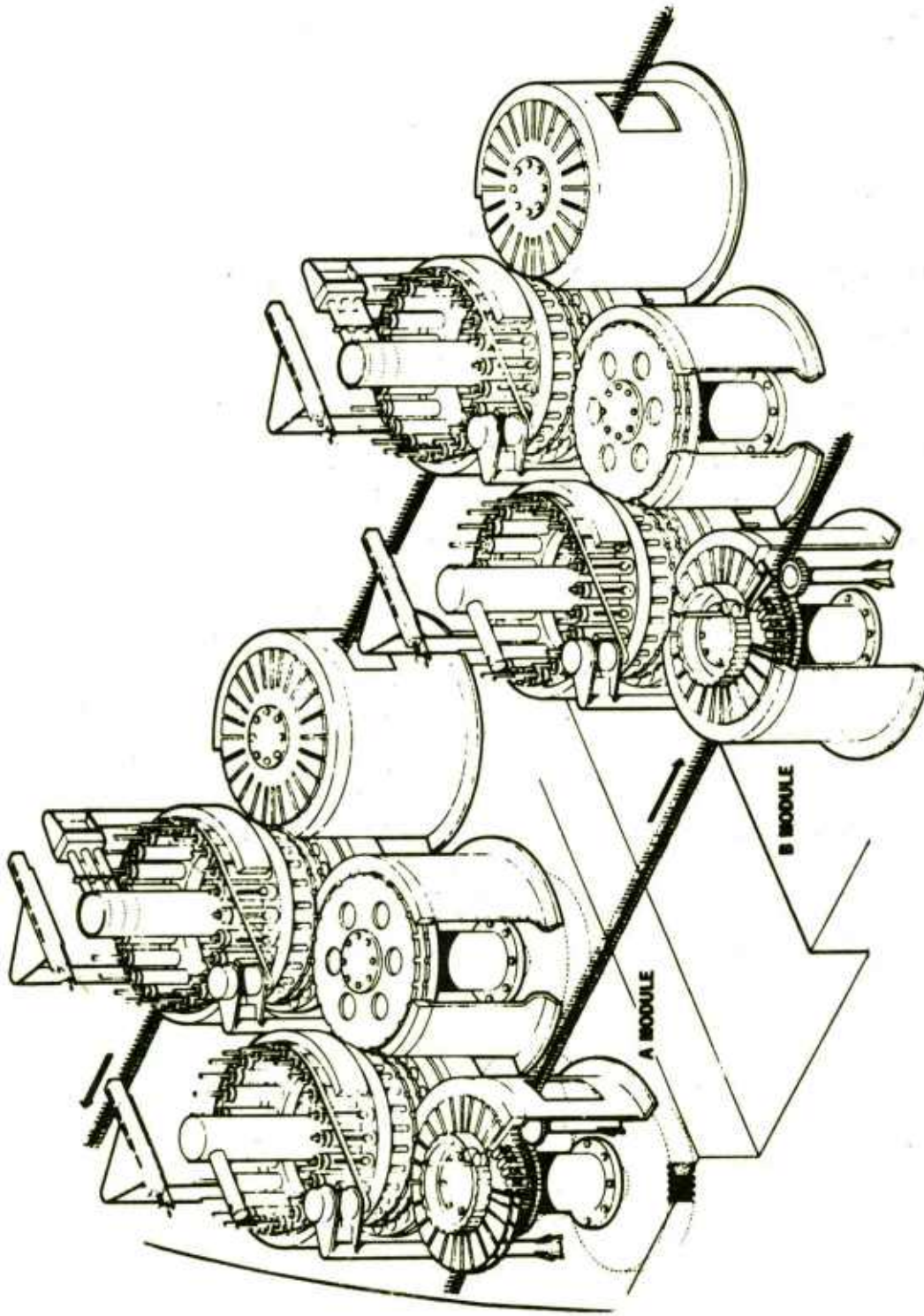
ARRCOM, with headquarters at Rock Island, IL, is the DOD Single Manager for Conventional Ammunition (SMCA). ARRCOM is responsible for integrated logistics (material readiness) management of nuclear and non-nuclear weapons and munitions. This includes follow-on procurement, production, engineering in support of production, industrial management, product assurance, material management, maintenance, value & logistics engineering, international logistics, and transportation and traffic management for assigned armament systems/materiel. As SMCA, it has responsibility for procurement, production and wholesale management of common-user conventional ammunition for the Army, Navy, and Air Force.

ARRCOM's materiel assignments include artillery, infantry, air defense guns, surface vehicle and aircraft mounted weapons systems, rocket and missile warhead sections, demolition munitions, offensive and defensive chemical materiel and related training equipment, test equipment, and tools. ARRCOM directs operations of four assigned arsenals, a Government-owned, Government-operated ammunition plant, twenty-seven Government-owned, contractor-operated (GOCO) ammunition plants, and an Army ammunition activity.

ARRADCOM is responsible for all research, development, and life cycle engineering of assigned weapon systems. Its mission also includes initial low-rate production for conventional systems and life cycle procurement and production for nuclear munitions. ARRADCOM also executes assigned missions in support of other DOD elements having centralized management responsibility for specific weapons systems or items. In addition to large-caliber, small-caliber, mission support and headquarters staffs at Dover, NJ, command elements include the Chemical Systems Laboratory and the Ballistics Research Laboratory at Aberdeen Proving Ground, MD, and Benet Weapons Laboratory at Watervliet, NY.

Integrated into ARRCOM's structure is the US Army Munitions Production Base Modernization Agency (MPBMA). The Agency is responsible for project management of the Munitions Production Base Modernization Program. The Agency exercises centralized management authority over the planning, direction, control and execution of the Program at all US Army Ammunition Plants and arsenals. A significant amount of interface between the MPBMA, ARRCOM, ARRADCOM, Air Force and Navy is necessary to assure integration of the MMT Program into related modernization plans.





**ARMAMENT R&D COMMAND**  
**ARMAMENT MATERIEL READINESS COMMAND**  
**(ARRADCOM, ARRCOM)**  
**(AMMUNITION)**



<u>CATEGORY</u>	<u>PAGE</u>
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Explosives -----	39
Fuzes -----	42
General -----	44
LAP -----	44
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Pollution Abatement -----	56
Propellants -----	58
Quality Control/Testing -----	61
Safety -----	64
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## AMMUNITION PROGRAM

Bridging the technology gap, particularly in those areas that have no civilian counterpart, is a challenging task for the Ammunition MMT Program. In many respects, the Ammunition program presents unique problems which require innovative solutions. Practically all current operations involve a great many hand operations, and methods must be found to efficiently mechanize these. Batch processes must be converted to continuous processes in order to take advantage of new materials handling techniques and to improve the safety of operations.

The primary objective of the Ammunitions Manufacturing Technology Program is to improve existing manufacturing processes, techniques and equipment. The second objective is to bridge the gap between development and full-scale production. The third objective is to solve technological problems identified in the program.

The Manufacturing Methods and Technology effort in the Load, Assemble and Pack area is guided by four major program goals; improved economy of operation, improved safety conditions for operating personnel, establishment of a rapid response production capability, and improvements in the quality of the end product produced. All of these goals must be accomplished within the standards and criteria established for pollution abatement and energy conservation.

Recent changes in policy and guidance have required Process Technology Projects to be cost effective within the timeframe and procurement quantities of the Five Year Defense Plan (FYDP). The challenge of introducing new technology within this guidance is being met by developing systems with the flexibility to produce many items, establishing an optimum balance between system simplicity and process operational requirements, and providing equipment designs capable of high efficiency operation to achieve cost effective system operations.

Due to the inherently hazardous nature of munitions production, an extensive program has been undertaken to upgrade the safety of explosive preparation equipment, loading equipment, and assembly systems. The MMT Program relating to the upgrading of the operational safety of loading lines is a continuation of current efforts. This program will define and investigate specific operational safety hazards, and will develop equipment and systems to reduce operator exposures and risks.

ARRADCOM  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY -----	FY82 ----	FY83 ----	FY84 ----	FY85 ----	FY86 ----
CHEMICAL	4719	8096	6416	5954	4770
ENERGY CONSERVATION	1370	1890	1354	3400	6720
EXPLOSIVES	1291	3610	640	1714	5300
FUZES	0	467	0	875	5460
GENERAL	2960	0	0	150	700
LAP	4498	3412	6381	7609	9380
METAL PARTS	3051	1911	2572	2515	6925
POLLUTION ABATEMENT	3037	2527	478	809	0
PROPELLANTS	2850	3618	5762	5725	3564
QUALITY CONTROL/TESTING	1861	295	2366	3542	8592
SAFETY	685	595	1118	460	894
SMALL ARMS	1483	2265	3346	5961	3839
	-----	-----	-----	-----	-----
TOTAL	27805	28686	30433	38714	56164

\*\*\*\*\*  
 \* C A T E G O R Y \*  
 \*-----\*  
 \*CHEMICAL\*  
 \*\*\*\*\*

MMT FIVE YEAR PLAN  
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- DECONTAMINATION

(0913) TITLE - SPIN COATING OF DECON AGENT CONTAINERS

255 166

PROBLEM - CURRENT METALLIC DECON AGENT CONTAINERS CORRODE BEFORE THE REQUIRED SHELF LIFE OF THE AGENTS IS REACHED. ALTERNATIVE CONTAINERS ARE NOT AVAILABLE, BUT PLASTIC LINERS HAVE BEEN SHOWN TO EXTEND THE LIFE OF CURRENT CONTAINERS SIGNIFICANTLY.

SOLUTION - ESTABLISH THE SPIN COATING, OR ROTATIONAL MOLDING, TECHNIQUE FOR COATING THE INSIDE OF CURRENT METALLIC CONTAINERS WITH CHEMICALLY RESISTANT POLYMERS FOR THE PRODUCTION ENVIRONMENT.

COMPONENT -- DETECTION/WARNING

(09D4) TITLE - CHEMICAL REMOTE SENSING SYSTEMS

300 1934 607 659

PROBLEM - FIRST GENERATION CHEMICAL REMOTE SENSING SYSTEMS HAVE HIGH PRIORITY. THEY REQUIRE COMPLEX, UNIQUE, SOPHISTICATED COMPONENTRY WHICH IS NOT AVAILABLE TO MEET PRODUCTION REQUIREMENTS. COMPONENTS WILL BE HAND FABRICATED FOR INITIAL DEVELOPMENT.

SOLUTION - IN ORDER FOR PRODUCTION TO BEGIN AS SOON AS POSSIBLE IT IS NECESSARY THAT APPROPRIATE MANUFACTURING TECHNOLOGY START BEING DEVELOPED NOW. CONTRACTORS WITH NECESSARY EXPERIENCE WILL BE UTILIZED TO ESTABLISH PROCEDURES, ETC. FOR QUANTITY MANUFACTURING.

(2957) TITLE - MFG TECH FOR AML AGENT ALARM, XM22.

800 1000 800

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP EFFORT AND FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TESTS TOOLING DESIGN DATA.

(2959) TITLE - MFG TECH, AUTOMATIC LIQUID AGENT DETECTOR

500 700 300

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNDS. THERE IS A NEED FOR A TECHNIQUE TO COAT THE CIRCULAR GROOVED DISC WITH SILVER FLAKE METALLIC PAINT AND STILL OBTAIN THE RESPONSE TIME REQUIRED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND/OR FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-HOUSE TEST TOOLING DESIGN DATA.

FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- DETECTION/WARNING

(2961) TITLE - MFG TECH FOR NBC RECON VEHICLE III

PROBLEM - PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AND CRITICAL COMPONENTS WILL HAVE TO BE ESTABLISHED. TWO CRITICAL COMPONENTS ARE THE MICRO-PROCESSOR AND MASS SPECTROMETER.

SOLUTION - MASS PRODUCTION PROCESSES AND TECHNIQUES MUST BE PROVEN OUT. DESCRIPTIONS OF MANUFACTURE WILL BE PREPARED AND IN-PROCESS TOOLING DATA ESTABLISHED.

500 1000 500

COMPONENT -- FILTERS

(0900) TITLE - AUTOMATED MULTIPLE FILTER LIFE TESTER

PROBLEM - THERE IS A LOW TEST RATE CAPACITY AND AN INCREASING VOLUME OF TESTING FOR THE CURRENT FILTER LIFE TEST EQUIPMENT.

SOLUTION - REDUCE MANPOWER NEEDS BY DEVELOPING A MULTIPLE TEST CHAMBER TESTER WHICH WILL PERMIT FOUR ITEMS TO BE TESTED SIMULTANEOUSLY.

252 50

(0905) TITLE - MANUFACTURE OF IMPREGNATED CHARCOAL (WHETERITE)

PROBLEM - ONLY ONE COMPANY (CALGON, INC) SUPPLIES WHETERIZED CHARCOAL AND CONSIDERS ITS PROCESS PROPRIETARY. THIS MATERIAL IS VITAL FOR NEW PROTECTIVE MASKS. A PROCESS MUST BE DEVELOPED TO DIVERSIFY PRODUCTION BASE AND REDUCE COST THROUGH COMPETITION.

256 721

SOLUTION - MMT PROJECT 5 76 1296 DEMONSTRATED THAT, USING DILUTE SOLUTIONS OF IMPREGNANTS AND MULTI-STAGE SOAKING AND DRYING OF CHARCOAL, SEVERAL CHARCOALS SHOWED DRAMATIC PROTECTION IMPROVEMENT. THIS PROJECT WILL USE THESE RESULTS TO ESTABLISH A PROCESS DESIGN

(0918) TITLE - MODERNIZATION OF FILTER PENETRATION EQUIPMENT

PROBLEM - CURRENTLY, ALL PROTECTIVE PARTICULATE FILTERS ARE TESTED WITH THREE TYPES OF EQUIPMENT. THIS EQUIPMENT IS OBSOLETE, INEFFICIENT, AND UNRELIABLE.

SOLUTION - DEVELOP PROTOTYPE TESTERS WITH SOLID STATE COMPONENTS UTILIZING STATE OF ART TECHNOLOGY.

848 700 285

(0919) TITLE - POLLUTION ABATEMENT FOR WHETERITE CHARCOAL

PROBLEM - THERE IS NO PROVEN PROCESS FOR THE TREATMENT AND DISPOSAL OF THE EFFLUENTS FROM THE MANUFACTURE OF WHETERIZED CHARCOAL.

SOLUTION - PROVIDE A PROVEN PROCESS TO TREAT AND DISPOSE OF ALL THE WASTES AND EFFLUENTS OF THE MANUFACTURING PROCESS.

793 501

FUNDING (\$000)

PRIOR	82	83	84	85	86
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COMPONENT -- FILTERS

(CONTINUED)

(1295) TITLE - MOD OF CHARCOAL FILTER TEST EQUIPMENT

PROBLEM - CHARCOAL FILTER TESTING EQUIPMENT NEEDED TO PROVIDE TESTING CAPABILITY FOR VARIOUS CHEMICAL AGENTS DOES NOT EXIST.

SOLUTION - DESIGN A MODULAR TESTING SYSTEM FOR VARIOUS FILTER SYSTEMS.

COMPONENT -- PROCESSES

(1348) TITLE - SUPER TROPICAL BLEACH

PROBLEM - THERE IS A MAJOR SHORTFALL BETWEEN THE FY78 REQUIREMENTS FOR THIS ITEM AND THE QUANTITY OF IMPORTED CHLORINATED LIME KNOWN TO BE AVAILABLE.

SOLUTION - THIS PROJECT WILL PROVIDE THE BASIC DESIGN OF A SUPER TROPICAL BLEACH FACILITY. STUDIES WILL INCLUDE POLLUTION ABATEMENT AND CONTROL EQUIPMENT TO ASSURE COMPLIANCE WITH OSHA AND EPA STANDARDS.

(12724) TITLE - TECHNOLOGY DATA BASE FOR CX

PROBLEM - CX (PHOSGENE OXIME) IS NOT AVAILABLE COMMERCIALY OR AT GOCO PLANTS TO SUPPORT DEV OF IT'S USE IN THE BINARY IVA MUNITION PROGRAM. THE TECH DATA BASE IS RESTRICTED TO LABORATORY TECHNOLOGY.

SOLUTION - ESTABLISH OPTIMUM PROCESSES AND OPERATIONAL MODES FOR SCALE-UP TO COMMERCIAL OR GOVERNMENT PRODUCTION FACILITIES.

(12725) TITLE - TECHNOLOGY DATA BASE FOR EA4923

PROBLEM - THE DATA BASE FOR EA4923 IS RESTRICTED TO LABORATORY DATA. PILOTING DATA IS LACKING AND INFORMATION FOR DESIGNING PRODUCTION FACILITIES DOES NOT EXIST AT THIS TIME.

SOLUTION - TO CONDUCT PROCESS STUDIES IN THE PILOT PLANT TO DETERMINE OPTIMUM OPERATING PARAMETERS AND GENERATE DATA TO SUPPORT THE DESIGN OF A PRODUCTION FACILITY.

(14491) TITLE - TECHNOLOGY DATA BASE FOR PINACOLYL ALCOHOL

PROBLEM - PINACOLYL ALCOHOL IS NOT CURRENTLY AVAILABLE COMMERCIALY IN PRODUCTION QUANTITIES AND THEREFORE, THE ARMY HAS NO AVAILABLE SUPPLY TO SUPPORT PRODUCTION OF HIGH PRIORITY BINARY IVA CHEMICAL MUNITIONS.

SOLUTION - THIS PROJECT WILL ESTABLISH THE OPTIMUM CHEMICAL PROCESSES AND OPERATIONAL MODES FOR PRODUCTION OF PINACOLYL ALCOHOL AND DEVELOP A TECHNICAL DATA BASE FOR SCALE-UP TO COMMERCIAL OF GOVERNMENT PRODUCTION FACILITIES

(14547) TITLE - PROCESS TECHNOLOGY FOR IR XM76 GRENADE

PROBLEM - NEW IR SMOKE SCREENING TECHNOLOGY NEEDED.

SOLUTION - DEVELOP PROCESS TECHNOLOGY FOR FUTURE 1PF.

605

888

561

459

1024

50

561

360

910

305

500

500

1655

485

1110

319

305



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- PROTECTIVE GEAR

(0909) TITLE - AUTOMATED AGENT PERMEATION TESTER

224

PROBLEM - MMT PROJECT 5 75 1314 DEVELOPED INSTRUMENTATION FOR AN IMPROVED PERMEATION TESTER. HOWEVER BECAUSE OF COST (\$5,000 PER TEST UNIT) AN ANTIQUATED METHOD USING FRUIT FLIES IS STILL USED FOR MOST OF THESE TESTS.

SOLUTION - A SYSTEM WILL BE DEVELOPED TO SEQUENTIALLY SAMPLE DATA FROM 10 TESTS AND FEED IT TO ONE TEST UNIT. SAMPLES OF ONE MINUTE EVERY TEN MINUTES WILL BE SUFFICIENT BECAUSE OF LONG TEST PERIODS (8 HOURS OR MORE). FLOW CONTROLS INCLUDE SOLENOID VALVES.

(0912) TITLE - PRODUCTION PROCESS F/PROTECTIVE MASK CANISTER BODIES

464

PROBLEM - THE CURRENT FIVE-STEP DEEP-DRAW PROCESS IS TIME CONSUMING, THE PROCESS HARDENS THE MATERIAL AND MAKES IT SUBJECT TO CRACKING.

SOLUTION - ESTABLISH A PROCESS WHEREBY THE CANISTERS WILL BE FORMED ON A PROGRESSIVE OIE MACHINE.

(0914) TITLE - AUTOMATIC FINISHING OF MASK COMPONENTS

701

PROBLEM - DURING MASK MOLDING OPERATIONS, AN EXCESS OF MATERIAL (FLASH) REMAINS ON THE MOLDING PARTS.

SOLUTION - DEVELOP TUMBLING IN A CRYOGENIC ENVIRONMENT AS AN AUTOMATED PROCESS TO REMOVE FLASH.

(1335) TITLE - MFG TECH FOR NEW PROTECTIVE MASK

5487 1000

PROBLEM - FABRICATION OF ONE-PIECE PLASTIC MASKS WITH ADEQUATE OPTICAL CHARACTERISTICS IS DIFFICULT. VISION REDUCTION AND DISTORTION ARE CRITICAL.

SOLUTION - DEVELOP MANUFACTURING PROCESS TO ALLEVIATE PRODUCTION PROBLEMS DEFINED BY PEP EFFORT.

COMPONENT -- PYROTECHNICS

(1709) TITLE - IMPR PROCESSING OF STARTER MIX FOR PYROTECHNIC MUNITIONS

500 446

PROBLEM - ACCIDENTAL INFLAMMATION OF MIXTURES DURING PROCESSING IS A SERIOUS PERSONNEL SAFETY PROBLEM DUE TO EXPOSURE TO FIRE AND EXPLOSIVE HAZARDS.

SOLUTION - EVALUATE NEW MIXING AND HANDLING TECHNOLOGY THAT WILL MINIMIZE EXPOSURE TO SAFE AND TOXIC MATERIALS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- PYROTECHNICS

(CONTINUED)

(3710) TITLE - DEVELOP MANUFACTURING TECHNOLOGY FOR 40MM AND CS MUNITIONS.

PROBLEM - CURRENT PRODUCTION FACILITIES EXIST ONLY IN PRIVATE INDUSTRY. THIS MUNITION WILL NOW BE PRODUCED IN GOGO FACILITY FOR MOB PURPOSES. CURRENT PROCESS REQUIRES IMPROVEMENTS FOR OSHA/EPA STANDARDS.

SOLUTION - THERE IS CURRENTLY A FACILITY FOR PRODUCTION OF THE 40MM RED, YELLOW, AND GREEN COLORED SMOKE MARKER. THE TECHNOLOGY NEEDED TO CONVERT AND MODIFY THIS FACILITY TO INCLUDE PRODUCTION OF THE 40MM, CS, M651 CARTRIDGE IS TO BE DEVELOPED.

(3726) TITLE - MMT FOR LAP OF MINIATURE TORCH

(4161) TITLE - PROC TECH FOR PDN OF 81 MM IMPRV SMOKE MUN

PROBLEM - A REQUIREMENT EXISTS FOR APPLYING THE IMPROVED SMOKE CONCEPT TO FILLING THE WARHEAD FOR THE 81 MM MORTAR.

SOLUTION - CONDUCT PROCESSING TECHNIQUE STUDIES FOR PREMIX, FILL, CLOSE AND LAP MUNITIONS PRODUCTION PROCESS DATA.

(4548) TITLE - SAFETY IMPROVEMENTS OF PYROTECHNIC MIXING

PROBLEM - PYROTECHNIC MIXING REQUIRES INCREASED PERSONNEL SAFETY FEATURES.

SOLUTION - EVALUATE CURRENT PROCESS AND INCREASE OPERATOR SAFETY THROUGH ADAPTION OF PROCESS CHANGES.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*ENERGY CONSERVATION \*  
\*\*\*\*\*

COMPONENT -- GENERAL

(2716) TITLE - USE OF HEAT FROM NITRIC ACID RECOVERY

PROBLEM - NITRIC ACID IS SEPARATED FROM SULFURIC ACID AND REMOVED AS A VAPOR TO THE DENITRATOR. THIS RESULTS IN A LOSS OF AVAIL ENERGY.

SOLUTION - THIS PROJECT INCLUDES THE PROCUREMENT, INSTALLATION AND EVAL OF APPROPRIATE HEAT TRANSFER EQUIP TO USE THE HEAT FROM NITRIC ACID VAPOR TO PREHEAT THE SPENT ACID FEED TO DENITRATOR, PRESENTLY ACCOMP BY THE USE OF STEAM.

FUNDING (\$DOD)

PRIOR 82 83 84 85 86

COMPONENT -- GENERAL

(CONTINUED)

(2717) TITLE - USE OF HEAT DISSIPATED IN ACID STEAM CONDENSER

395

PROBLEM - PART OF DENITRATION OPR INCLUDES TRANS OF EXCESS DENITRATION STEAM TO ACID STEAM CONDENSER WHERE CONDENSED+COOLED BEFORE FED TO NITRIC ACID ABSORPTION TOWER. CONDENSED+COOL OF NITRIC ACID SOLUTION IS ACCOMP BY COOL WATER, RESULTING IN LOSS OF AVAIL ENERGY

SOLUTION - PROJ COVERS PROCURE, INSTALL + EVAL OF HEAT TRANSFER EQUIP TO USE AVAIL HEAT IN WEAK NITRIC ACID VAPOR TO PREHEAT THE MIXED ACID FEED TO DENITRATOR + REDUCE NEED F/STEAM PRESENTLY BEING USED FOR THIS PURPOSE.

(2718) TITLE - UTILIZATION OF HEAT GENERATED IN TNT MANUFACTURE

470 285

PROBLEM - NO EFFECTIVE USE IS BEING MADE OF THE HEAT REMOVED BY COOLING WATER DURING THE NITRATION STAGES IN THE MANUFACTURE OF TNT.

SOLUTION - INSTALL HEAT TRANSFER EQUIPMENT TO RECOVER THE HEAT GENERATED BY THE NITRATION REACTIONS FOR USE IN THE TNT PURIFICATION OPERATIONS.

(2720) TITLE - USE OF HEAT FROM SULFURIC ACID RECOVERY

745

PROBLEM - SPENT ACID FROM TNT PLANT IS HEATED BY STEAM + FED TO DENITRATOR WHERE NITRIC ACID IS SEP FROM SULFURIC ACID LEAVING SYS AT A TEMP OF APPROX 316F. COOLING WATER IS USED TO REDUCE TEMP OF SULFURIC ACID TO 120F, RESULTING IN LOSS OF AVAIL ENERGY.

SOLUTION - PROJ INCLUDES THE PROCURE, INSTALLATION + EVAL OF HEAT TRANSFER EQUIP TO PREHEAT SPENT ACID W/HEAT FROM THE SULFURIC ACID + MINIMIZE THE NEED FOR STEAM FOR THIS PURPOSE.

(2722) TITLE - HEAT RECOVERY FROM CYCLOHEXANONE VAPOR

405

PROBLEM - CRUDE RDX OR HMX IS DISSOLVED IN WATER/CYCLOHEXANONE SOLUTION W/AID OF STEAM HEAT. IT IS THEN RECRYSTAL TO OBTAIN DESIRED CRYSTALLINE SIZE + CONFIG BY EVAP CYCLOHEXANONE-CYCLOHEXANONE VAPOR CONDENSED BY COOLING WATER. PROCESS IS ENERGY INTENSIVE.

SOLUTION - THIS PROJ INVOLVES USE OF HEAT AVAIL FROM THE CYCLOHEXANONE VAPOR TO ACHIEVE DISSOLUTION OF THE RDX/HMX CRYSTALS + THEREBY REDUCE THE REQUIREMENT FOR STEAM.

(2740) TITLE - CAD OF AAP'S BASED ON ENERGY CONSIDERATIONS

285

PROBLEM - ADAPT NECAP (NASA ENERGY COST ANALYSIS PROGRAM) TO ACCOUNT FOR THE UNIQUE DESIGN FEATURES OF AAP'S.

SOLUTION - NECAP IS A PROGRAM FOR DETERMINING BUILDING DESIGN COST EFFECTIVENESS BASED ON ENERGY CONSIDERATIONS. MUST BE ADAPTED TO THE UNIQUE DESIGN FEATURES FOUND IN AAP'S.

FUNDING (\$DOD)

PRIOR 82 83 84 85 86

COMPONENT --- GENERAL

(CONTINUED)

(3714) TITLE - ALTERNATIVE AZEOTROPIC SOLVENT FOR ACETIC ACID CONCENTRATION  
PROBLEM - CURRENT ACETIC ACID CONCENTRATION PROCESS AT HSAAP USES N-PROPYL ACETATE AS AN EXTRACTING AGENT TO REMOVE WATER FROM THE ACETIC ACID. THE CURRENT PROCESS USES VERY LARGE QUANTITY OF ENERGY FOR THIS PROCESS  
SOLUTION - REPLACE THE N-PROPYL ACETATE WITH N-BUTYL ACETATE. N-BUTYL ACETATE IS A MUCH MORE EFFICIENT AZEOTROPIC AGENT THAN N-PROPYL ACETATE.  
(4281) TITLE - CONSERVATION OF ENERGY AT AAP  
PROBLEM - PETROLEUM MAY NOT BE AVAILABLE IN FUTURE TO MEET PRODUCTION REQUIREMENTS.  
SOLUTION - DEVELOP ENERGY SAVING TECHNOLOGY TO APPLY TO AAP MANUFACTURING FUNCTIONS TO REDUCE QUANTITY OF ENERGY USED AT ALL LEVELS OF PRODUCTION.  
(4481) TITLE - PYROLYSIS OF AAP WASTE  
PROBLEM - WASTE IS DESTROYED WITHOUT RECOVERY OF ENERGY.  
SOLUTION - RECOVER ENERGY FROM WASTE.

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\* C A T E G O R Y \*  
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\*EXPLOSIVES\*  
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COMPONENT --- COMP B

(4037) TITLE - PROCESS IMPROVEMENT FOR PLASTIC-BOND EXPLOSIVES  
PROBLEM - PRESENT METHODS OF PRODUCING PBX COMPOSITIONS ARE JOB-SHOP ORIENTED AND UNECONOMICAL FOR LARGE SCALE PRODUCTION PROJECTED IN THE FUTURE.  
SOLUTION - DEVELOP NEW TECHNIQUES OF COATING, DRYING, AND PACKAGING PBX COMPOSITIONS. FIRST ATTEMPT WILL BE TO EVALUATE EQUIPMENT SELECTED FOR COMPOSITION C4 UNDER PROJ 4449.  
(4267) TITLE - CONTINUOUS PROCESS FOR GRANULAR COMPOSITION B  
PROBLEM - THE BATCHWISE COOLING PROCESS OF RDX/TNT/MAX SLURRY ALLOWS ONLY A LIMITED CONTROL OF GRANULATION.  
SOLUTION - DEVELOP AND USE A CONTINUOUS PROCESS TO PRODUCE GRANULAR COMPOSITION B.

COMPONENT --- HMX/RDX

(3715) TITLE - AUTOMATE HMX NITROLYSIS OPERATIONS

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- HMX/RDX

(CONTINUED)

(4406) TITLE - IMPROVE YIELD OF HMX DURING RDX NITROLYSIS

633 701 640

PROBLEM - THE CURRENT MANUFACTURING PROCESS FOR HMX IS INEFFICIENT IN THAT YIELDS OBTAINED ARE STILL LESS THAN THEORETICAL.

SOLUTION - THE CURRENT BACHMANN PROCESS WILL BE MODIFIED TO INCREASE THE HMX YIELD BEYOND 30 PERCENT.

(4423) TITLE - ON-LINE MOISTURE ANALYZER FOR RDX/HMX MFG

410

(4449) TITLE - PROCESS IMPROVEMENT FOR COMPOSITION C-4

403 520

PROBLEM - THE EXISTING FACILITIES WHICH ARE COMMON TO THE MANUFACTURE OF COMPOSITION B AND THE OTHER RDX COMPOSITION WOULD LIMIT THE AVAILABILITY OF THESE ITEMS BELOW THEIR MOB REQUIREMENTS.

SOLUTION - ESTABLISH NEW PROCESSES AND METHODS FOR THE MANUFACTURE OF THESE ITEMS TO MINIMIZE THE IMPACT OF COMMON OPERATIONS ON CAPACITY.

(4515) TITLE - HEXAMINE MANUFACTURING AND SOLUTION PREPARATION

194

PROBLEM - THERE IS INSUFFICIENT SUPPLY OF HEXAMINE TO PRODUCE RDX AND HMX MOBILIZATION REQUIREMENTS. MUCH OF THE TECHNOLOGY IS AVAILABLE TO PERMIT MANUFACTURE ON-SITE. THE PREPARATION OF AN ACETIC ACID-HEXAMINE SOLUTION FROM AQUEOUS HEXAMINE REQUIRES STUDY.

SOLUTION - VERIFY DISTILLATION ASSUMPTIONS ON BENCH SCALE PRIOR TO PROCEEDING WITH FULL-SCALE DESIGN.

COMPONENT -- IHEP

(4500) TITLE - EVAL INDUST CAPABILITY F/LOAD COMMERCIAL EXPL-HIGH USE MUNIT

473 450 1200

PROBLEM - DURING MOBILIZATION THERE CAN BE A SHORT FALL IN AVAILABILITY OF MILITARY EXPLOSIVES. INDUSTRY HAS MANY SAFE EXPLOSIVE FORMULATIONS. THEIR APPLICABILITY TO MILITARY USAGE IS UNKNOWN. INDUSTRIAL CAPABILITY FOR MILITARY FILLING THESE EXPL IS UNKNOWN.

SOLUTION - CONDUCT A PROGRAM TO IDENTIFY THE QUANTITIES AND TYPES OF COMMERCIALLY AVAILABLE EXPLOSIVES THAT COULD BE USED TO SUPPLEMENT THE ARMY'S PRODUCTION CAPABILITIES DURING EMERGENCY PRODUCTION PERIODS. EVALUATE THE PERFORMANCE OF MUNITIONS PRODUCED THIS WAY

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- NITROCELLULOSE

(4571) TITLE - INCREASED COTTON LINTERS NITRATING CAPACITY

250

PROBLEM - NITROCELLULOSE, MADE FROM BALED COTTON LINTERS, HAS APPROXIMATELY ONE FOURTH THE THROUGHPUT THAT IT DOES WHEN MADE FROM SHEETED WOOD PULP. THIS PROBLEM SEEMS TO BE ASSOCIATED WITH THE INABILITY TO DROWN OR COMPLETELY WET AND PENETRATE THE COTTON.

SOLUTION - INCREASE AND EVALUATE THE AGITATION IN THE FIRST NITRATOR.

COMPONENT --- PROCESS CONTROL

(1906) TITLE - ADAPTIVE CONTROL OF EXPLOSIVES LINES

1430

PROBLEM - TAKE ADVANTAGE OF THE ADVANCED PROCESS CONTROL TECHNOLOGY FOR APPLICATION TO EXPLOSIVE PROCESSES TO REDUCE MANPOWER COSTS AND PERSONNEL EXPOSURE AND INCREASE PROCESS PRODUCTIVITY.

SOLUTION - ADAPT MINI-PROCESS CONTROLS D- D---S D S O PROPELLANT PROCESSES WITH REDUCTION IN COSTS, ENHANCED REAL TIME CONTROL, REDUCED PERSONNEL EXPOSURE AND IMPROVED OVERALL EFFICIENCY.

(1913) TITLE - PBX CONT CAST FOR BOMB LOADING

500 1250

PROBLEM - ADDED USE OF CASTABLE PLASTIC BONDED EXPLOSIVES WILL CREATE PRODUCTION SHORTFALLS. MUST PBX CAN NOT BE USED IN PRESENT MELT / CAST EQUIPMENT. PBX PRODUCTION IS NOW DONE AT 2 NAVY PLANTS WHICH COULD NOT HANDLE LOADING OF CASTABLE PBX IN BOMBS.

SOLUTION - ESTABLISH HIGH PRODUCTION RATE CONTINUOUS PROCESSES FOR MIX AND CAST OF VARIOUS PBX FORMULATIONS. IDENTIFY + EVALUATE EQUIPMENT + PROCESSES. SELECT + TEST EQUIPMENT + INTEGRATE ACCEPTABLE ITEMS INTO AN OPERATING PBX PROCESSING PILOT PLANT.

(3708) TITLE - PROCESS FOR MANUFACTURE OF ETHYLENE DIAMINE DINITRATE (EDAN)

300

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

COMPONENT --- TNT

(3729) TITLE - MFG PROCESSES F/SPEC CONCRETE STRUCTURE DEMOLITION CHARGES

250



FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- TNT

(4452) TITLE - REPROCESSING DEMILLED EXPLOSIVES

PROBLEM - LARGE QUANTITIES OF EXPLOSIVES FROM DEMILITARIZATION ARE DESTROYED ANNUALLY, PRIMARILY BY BURNING BECAUSE NO ESTABLISHED METHOD IS AVAILABLE FOR REPROCESSING THE MATERIAL FOR REUSE IN MUNITIONS LOADING.

SOLUTION - DEVELOP PROTOTYPE EQUIPMENT FOR REPROCESSING/REFINING RECLAIMED EXPLOSIVES, ANALYZE THE QUALITY, ENERGY POTENTIAL, AND LOADING RESULTS OF P RECLAIMED EXPLOSIVES USED ALONE OR AS A MIXTURE WITH VIRGIN MATERIAL.

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\* C A T E G O R Y \*  
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\*FUZES\*  
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COMPONENT -- ELECTRONICS

(L222) TITLE - BORESIGHTING MF SFF WMD W/IR SENSOR

PROBLEM - NO PRODUCTION PROCESS EXISTS TO BURE SIGHT STORM WARHEAD TO IR SENSOR. PRESENT HAND PROCESS REQUIRES SEVERAL HOURS AND IS UNRELIABLE.

SOLUTION - DEVELOP EQUIPMENT TO AUTOMATE PROCESS.

(2734) TITLE - TEST AND PROCESSES FOR GUN RUGGED CRYSTAL OSCILLAT

PROBLEM - THERE IS A NEED FOR PRODUCTION TEST EQUIPMENT AND PROCESSES THAT CAN TEST AND SCREEN QUARTZ CRYSTALS TO INSURE SURVIVABILITY IN THE BALLISTIC ENVIRONMENT.

SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION SCREENING OF QUARTZ CRYSTALS TO INSURE SURVIVABILITY IN THE BALLISTIC ENVIRONMENT.

(3716) TITLE - SENSOR TECHNOLOGY

PROBLEM - REPLACE CONVENTIONAL (AND COMPLEX) FUZES WITH OPTICAL SENSING DEVICES.

SOLUTION - THIS TECHNOLOGY (SENSOR) WILL BE HIGHLY AUTOMATED IN PRODUCTION AND HIGHLY ACCURATE IN USE (COMMERCIAL APPLICATIONS WILL BE NUMEROUS IN THIS TIME SPAN).

(3731) TITLE - MFG PROCESSES F/XM742 AND XM762 ELECTRICAL TIMER

(3742) TITLE - MFG PROCESSES F/MILLIMETER WAVE TECH FUZES/SEEKER SYSTEMS

200 115

1000

1000

1000

1500

385

964

295

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- ELECTRONICS

(CONTINUED)

COMPONENT -- METAL PARTS

(2736) TITLE - CHEMICAL MACHINING OF PRECISION COMPONENTS

120

PROBLEM - HOLDING TOLERANCES AND HIGH SCRAP RATES ARE COMMON PROBLEMS WHEN SMALL THIN FUZE PARTS ARE STAMPED IN A PRESS. STAMPING IS CAPITAL INTENSIVE AND IS ONLY GOOD FOR VERY HIGH VOLUME QUANTITIES.

SOLUTION - CHEMICAL MACHINING OF COMPONENTS REQUIRES LESS CAPITAL EQUIPMENT AND PRODUCES A MUCH SMALLER QUANTITY OF SCRAP.

(4401) TITLE - HOT FORMING + COLD HEADING LARGE FUZE COMPONENTS

275

PROBLEM - MULTISPINDLE BAR MACHINES DATE FROM 1950'S. THEY HAVE LOW PRODUCTIVITY, DO NOT MEET OSHA, CAN'T USE CARBIDE TOOLS, NO SPARE PARTS.

SOLUTION - APPLY MOD TECH SUCH AS HOT FORGE AND COLD HEADING TO OBTAIN SHAPE + REDUCE MACHINING AND SCRAP. THIS ALLOWS HIGH SPEED CHUCKERS FOR FINISH MACHINING.

COMPONENT -- QA/TESTING

(2739) TITLE - TEST EQPT AND PROCESSES FOR XM762 ELECTRONIC FUZE

725

PROBLEM - THERE IS A NEED FOR THE EQUIPMENT AND PROCESSES THAT CAN PROVIDE PRODUCTION TESTING OF FUZE ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.

SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP TESTING APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION TESTING OF FUZE COMPONENTS AND ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.

COMPONENT -- THICK FILM

(1800) TITLE - PROCESSING FOR METAL-BASED SUBSTRATES

467

PROBLEM - PROJECT WILL DEMONSTRATE FEASIBILITY OF USING THICK FILM NON-NOBLE METALS IN LIEU OF GOLD AS THE CONDUCTIVE MEDIUM ON PORCELAIN-COATED STEEL SUBSTRATES. PROBLEMS INVOLVE PRINTING, FIRING, TRIMMING AND WIRE BENDING.

SOLUTION - TECHNIQUES FOR WIRE BONDING AND CONDUCTOR PASTE ADHESION WILL BE ESTABLISHED. LASER TRIM PARAMETER CHANGES WILL BE DOCUMENTED. NON-OXIDIZING FURNACE FIRING WILL BE USED FOR THE NON-NOBLE CONDUCTIVE MEDIUM.

MMT FIVE YEAR PLAN  
RCS ORCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

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\* C A T E G O R Y \*  
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\*GENERAL\*  
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COMPONENT -- MISCELLANEOUS

(2742) TITLE - LASER APPLIED DURABLE COATINGS  
PROBLEM - PRODUCTIVITY IS A FUNCTION OF RAM TO INCREASE RELIABILITY AND  
REDUCE MAINTENANCE DOWNTIME AND COST IN THE MUNITIONS PLANT ENVIRONMENT IS  
VERY DIFFICULT.

SOLUTION - UTILIZE LASER APPLIED DURABLE COATINGS ON MACHINE AND TOOL WEAR  
SURFACES AND IN CORROSIVE ENVIRONMENTS.

(3730) TITLE - MFG PROCESSES F/SENSOR OFF-ROUTE MINE SYSTEM (STORMS)

(4309) TITLE - PROCESS DEVEL F/120MM AMMO

PROBLEM - MASS PRODUCTION IN THE US OF W. GERMAN 120MM TANK AMMUNITION POSES  
PROBLEMS IN FOUR FUNCTIONAL AREAS - METAL PARTS, PROPELLANT, FUZE, AND LAP.

SOLUTION - THIS IS A MULTI-YEAR EFFORT IN FOUR FUNCTIONAL AREAS. A SEPARATE  
TASK ADDRESSES EACH UNIQUE PROBLEM. THIS MMT SUPPORTS FACILITY PROJECTS IN  
FY83-84 AND IS ESSENTIAL TO FIELDING THE 120MM GUN SYSTEM ON THE XM1 TANK IN  
FY85.

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\* C A T E G O R Y \*  
\*-----\*  
\*LAP\*  
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COMPONENT -- ASSEMBLY

(D030) TITLE - LAP OF SENSE AND DESTROY ARMOR (SADARM)

PROBLEM - SADARM COMPONENTS ARE COSTLY TO LAP. NO ECONOMICAL PRODUCTION  
SYSTEM EXISTS.

SOLUTION - DEVELOP ECONOMICAL METHODS FOR LAP OF SADARM COMPONENTS.

(2706) TITLE - AUTOMATIC PROCESSING OF PARACHUTE ASSEMBLIES

PROBLEM - PARACHUTE ASSEMBLY AT PRESENT IS AN OPERATOR CONTROLLED PROCESS  
DEVELOPED FROM HAND FOLDING OF MANNED PARACHUTES. THIS IS A TIME CONSUMING  
AND COSTLY PROCESS REQUIRING EXPERIENCE AND OVERTERSE PERSONNEL.

SOLUTION - UTILIZING FAVORABLE RESULTS OF PRIOR YEAR FEASIBILITY STUDIES,  
BUILD AND TEST A FULL SCALE PROTOTYPE SYSTEM FOR ECONOMICAL, RELIABLE, HIGH-  
RATE, SEMI-AUTOMATIC ASSEMBLY OF PARACHUTE COMPONENTS FOR AMMUNITION ITEMS.

150 200

500

4576 296D

950 950

215 160

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- ASSEMBLY

(CONTINUED)

(4062) TITLE - AUTO MFG SUPPORT FOR MORTAR INCREMENT CONTAINERS

PROBLEM - THE MANUFACTURE AND ASSEMBLY OF THE 60/81MM PROP CHARGE INCREMENT CONTAINER IS LABOR INTENSIVE AND DOES NOT MEET PRODUCTION REQUIREMENTS.

SOLUTION - DEVELOP PROCESS AND EQUIPMENT TO REDUCE COSTS, INCREASE PRODUCTION RATES, AND IMPROVE QUALITY.

3809 2012

(4198) TITLE - AUTOMATED LAP OF STICK-PROPELLANT CHARGES

PROBLEM - STICK PROPELLANT CHARGES HAVE NO LAP PROCESSING PRECEDENT. CURRENT MANUAL METHODS OF PRODUCTION ARE INEFFECTIVE IN ACHIEVING SATISFACTORY LEVELS OF QUALITY, COST, SAFETY AND PRODUCTION READINESS.

SOLUTION - EFFICIENT HIGH SPEED AUTO LAP EQUIPMENT WILL BRING PRODUCTION OF STICK PROPELLANT CHARGES TO A LEVEL CONSISTENT WITH MODERN TECHNOLOGY. AN INITIAL ENGINEERING STUDY TO DEFINE CONCEPTS AND PARAMETERS TO BE FOLLOWED BY PROTOTYPE EQUIPMENT IS PROPOSED.

1DD7

(4368) TITLE - DEV AUTOMATED EQPT FOR SEALING M55 DETONATORS

PROBLEM - CURR M55 DETS ARE BEING LACQUERED. 2 APPROACHES TO SEALING ARE BEING INVEST. 1 USED FOIL PRECOATED W/ADHESIVE + THE OTHER WELDS THE DET CUP TO FOIL. BOTH CAN BE PERFORMED ON A LOADER. LESS HANDLING WILL REDUCE COST OF DET.

SOLUTION - DEVELOP EQUIPMENT BASED ON EITHER THE HOT MELT ADHESIVE OR ULTRA SONIC WELDING TECHNIQUE CURRENTLY BEING INVESTIGATED. RETROFIT BOTH SINGLE-TOOL AND MULTI-TOOL DETONATOR LOADERS WITH EQUIPMENT TO SEAL THE M55 DETONATOR.

569 226

(4523) TITLE - RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES

PROBLEM - PRESENT MOISTURE ANALYSIS TECHNIQUE REQUIRES SOME 3 3/4 HOURS PER SAMPLE. IN AN AUTOMATED BACKLINE, THIS IS TOO LONG A PERIOD TO WAIT RELATIVE TO AN ACCEPTANCE/REJECTION DECISION FOR THE BATCH.

SOLUTION - INVESTIGATE THREE KNOWN TECHNIQUES FOR RAPID MOISTURE ANALYSIS AND PROCEED WITH THE OPTIMUM TO THE PROTOTYPE STAGE.

2D2

(4595) TITLE - AUTOMATED ASSEMBLY OF M21 FLASH SIMULATOR

PROBLEM - THE LONGHORN AAP PRODUCTION LINE IS BASICALLY A HAND LINE OPERATION WHICH IS LABOR INTENSIVE AND EXPOSES THE LINE OPERATORS TO POTENTIALLY HAZARDOUS OPERATIONS.

SOLUTION - DEVELOP SEMI-AUTOMATED OR MECHANIZED ASSEMBLY EQUIPMENT WHICH WOULD SIGNIFICANTLY REDUCE THE PRODUCTION MANPOWER REQUIREMENTS AND REDUCE THE EXPOSURE OF PERSONNEL TO POTENTIALLY HAZARDOUS OPERATIONS.

550 870

COMPONENT --- GENERAL

(D003) TITLE - APPLICATION OF NEW INDUSTRIAL PROCESSES TO LAP TECHNOLOGY

600

PROBLEM - THERE ARE NUMEROUS REQUIREMENTS IN THE LAP AREA THAT COULD TAKE ADVANTAGE OF THE LATEST TECHNOLOGY DEVELOPMENT IN INDUSTRY. WE MUST PROVIDE FOR THE APPLICATION OF THIS TECHNOLOGY TO OUR LINES THROUGH ENGINEERING PROJECTS.

SOLUTION - THIS TECHNOLOGY THRUST COVERS THE APPLICATION OF NEW TECHNOLOGY DEVELOPMENTS IN INDUSTRY TO LAP PROCESSES. THESE MAY INVOLVE WEIGHING, MATERIAL HANDLING, MATERIAL DEVELOPMENT, AND EQUIPMENT APPLICATION.

(P015) TITLE - DEVELOP TECHNOLOGY FOR MFG OF DELAY TRAINS

250

PROBLEM - DELAY TRAIN PRODUCTION CONTRACTED OUT. DISRUPTION OF PRODUCTION. D EFFECTIVE COMPONENTS.

SOLUTION - PROVIDE DELAY TRAIN MFG IN-HOUSE. PROVIDE INLINE CONCEPT FOR ITEMS. PROVIDE INTEGRATED FACILITY.

(27D3) TITLE - THREAD CLEANING/INSPECTION OF HE LOADED MUNITIONS

240

PROBLEM - THE THREADS OF HE LOADED MUNITIONS ARE CLEANED INDIVIDUALLY BY HAND. THE OPERATION IS LABOR INTENSIVE AND HAZARDOUS TO THE OPERATOR.

SOLUTION - UTILIZING CURRENT TECHNOLOGY DESIGN + BUILD PROTOTYPE EQUIP THAT WILL CLEAN, INSPECT + TRANSFER THE MUNITION THROUGH ENTIRE OPERATION CYCLE AUTOMATICALLY.

(27I2) TITLE - MOISTURE MEASUREMENT INSTRUMENTATION

150

PROBLEM - MEASUREMENT OF MOISTURE CONTENT IN POWDERED EXPLOSIVES USED IN REGULAR PROD IS CURRENTLY DONE ON A DAILY SAMPLING BASIS USING TIME CONSUMING + EXPENSIVE LABORATORY TECHNIQUES.

SOLUTION - SECURE + INSTALL RAPID MOISTURE MEASUR INSTRUMENTATION ON PROD LINE. EQUIP WILL PROVIDE QUICK + ACCURATE READOUTS OF PERCENT MOISTURE CONTENT. PRECISE DESIGN + SELEC OF APPROPRIATE INSTRUMENT COMPONENTS WILL BE ACCOMP BY EXECUTION OF PROJ.

(4251) TITLE - AUTO MANU OF DELAY FOR M549 AND XM65D PROJECTILES

968

PROBLEM - CURRENT OPERATION ARE LABOR INTENSIVE. COST OF ITEM IS HIGH.

SOLUTION - DEV AUTO LAP EQUIP.

(4522) TITLE - AUTO CARRIER CLEANING STATION FOR DET FAC

621

PROBLEM - CARRIERS USED IN PRODUCTION MAY HAVE CONSIDERABLE POWDER ON THEM WHICH MUST BE REMOVED IN A SAFE MANNER. THE CURRENT MANUAL OPERATION IS POTENTIALLY HAZARDOUS.

SOLUTION - DEVELOP AN AUTOMATED POWDER REMOVAL AND CLEANING STATION FOR THE AUTOMATED CONVEYOR SYSTEM AT THE LSAAP MODERNIZED DETONATOR FACILITY.

MMT FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- GENERAL

(CONTINUED)

(4550) TITLE - AUTO ASSY OF M22 FLASH SIMULATOR

465 840

PROBLEM - ITEM MANUFACTURED IN TEST QUANTITIES ONLY. PLANS ARE TO PROCURE FROM LONGHORN AAP ON HAND LINE WHICH IS EXPECTED TO RESULT IN A LABOR INTENSIVE OPERATION.

SOLUTION - THE MMT WILL DEVELOP AUTOMATED EQUIPMENT AND REDUCE LABOR FOR MANUFACTURE.

COMPONENT -- LOAD

(0001) TITLE - 60MM SMOKE PDM TECH F/IMPROVED SMOKE MUNITION

460 450

PROBLEM - A FAMILY OF NEW IMPROVED RP OR WP SMOKE ROUNDS INCLUDING 60MM MORTAR IS BEING DEVELOPED. FUTURE PRODUCTION IS DEPENDENT ON THE AVAILABILITY OF NEW TECHNOLOGY AND PRODUCTION EQUIPMENT.

SOLUTION - DEVELOP TECHNOLOGY REQUIRED TO DESIGN PILOT EQUIPMENT FOR FILLING IMPROVED SMOKE 60MM MUNITION INCORPORATION RP WICK MATERIAL WITH WP.

(1308) TITLE - PRESS/INJECTION LOADING OF INSENSITIVE HE

200

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

(1018) TITLE - DEVELOP IMPROVED FILLING METHOD FOR M74 ROCKET

250 400

PROBLEM - TPA FILLING METHOD IS SLOW AND CAUSES INEFFICIENT OPERATION.

SOLUTION - EVALUATE AND SELECT OPTIMUM FILL EQUIPMENT TO REDUCE FILLING TIME.

(1244) TITLE - MODERNIZATION OF TRACER LOADING

750

PROBLEM - CURRENT TRACER LOADING TECHNOLOGY UTILIZES CONSIDERABLE LABOR, SLOW/SINGULAR OPERATING TYPE PRESSING MACHINES.

SOLUTION - DEVELOP MODERN AUTOMATED MULTIPLE ITEM LOADING EQUIPMENT. HIGH PRODUCTION, LOW MAINTAINABILITY, ECONOMICAL AND RELIABLE EQUIPMENT ADAPTABLE TO NUMEROUS TRACER ITEMS WILL RESULT.

(1367) TITLE - DEVELOP MFG TECHNOLOGY FOR XM96 CS ROCKET

400

PROBLEM - NEVER PRODUCED AT PBA. MOBILIZATION REQUIREMENT.

SOLUTION - PROVIDE MFG TECHNOLOGY. PROVIDE DESIGN CRITERIA FOR IPF.



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- LOAD

(CONTINUED)

(1701) TITLE - BULK TRANSFER OF CHEMICAL MATERIALS

PROBLEM - CURRENT TECHNIQUE FOR RETRIEVAL WEIGHING AND TRANSPORTING PYROTECHNIC CHEMICAL CONSTITUENTS ARE ACCOMPLISHED BY LABOR INTENSIVE OPERATION AND ARE UNSAFE.

SOLUTION - AN EFFICIENT MATERIALS HANDLING SYSTEM WILL BE SURVEYED AND DEVELOPED SO THAT EPA/OSHA STANDARDS WILL BE MET.

221 207

(2016) TITLE - COLD PRESSING OF EXPLOSIVES

PROBLEM - LOAD OF HMX EXPLOSIVES INTO SHAPED CHARGES + PRESSED AMMO + PRESSING PELLETS IS SLOW + COSTLY DUE TO HEAT, VACUUM + NOT PRESSING REQ. USE OF EXPLOSIVE TO OVERCOME POTENTIAL EXUDATION + LOW DENSITY CHARGE PROBLEMS W/CAST CHARGES CANNOT BE REALIZED.

SOLUTION - NEW EXPLOSIVE HAS BEEN DEV. WHICH HAS HMX AS ITS BASE, PROPERTIES SIM TO OCTOL + LX14 EXPLOSIVES + CAN BE COLD PRESSED. AUTOMATING COLD PRESSING OF HMX WILL ENHANCE ITS USE, WILL REDUCE COST DRASTICALLY + ELIM POTENTIAL FOR EXPLOSION.

750

(2018) TITLE - INJECTION MOLDING TECHNIQUES FOR ACM/CEMS

PROBLEM - CURRENT EXPLOSIVE LOADING TECHNIQUES FOR SMALL MUNITIONS USE GRAVITY POURING WHICH REQUIRES PERSONNEL EXPOSURE TO EXPLOSIVES AND RESULTS IN LARGE AMOUNTS OF RISER SCRAP.

SOLUTION - DEVELOP AUTOMATIC PRODUCTION INJECTION MOLDING EQUIPMENT TO LOAD ACM AND CEM ITEMS WHICH WILL VIRTUALLY ELIMINATE EXPLOSIVE RISER SCRAP AND DRASTICALLY REDUCE PERSONNEL EXPOSURE.

285

(2707) TITLE - IMPROVED PROCESS FOR HE CAVITY FORMING

PROBLEM - CURRENT GUCO PROCESSES REQUIRE MACHINING OF EXPLOSIVE CAVITIES. THIS IS VERY HAZARDOUS AND MUST BE PERFORMED BEHIND A BARRICADE AND IS VERY COSTLY.

SOLUTION - REDESIGN HE POURING FUNNEL TO ELIM MACHINING. THIS WILL DRASTICALLY REDUCE COST AS NO BARRICADE IS REQUIRED, EXPENSIVE MACHINERY/MAINT IS ELIMINATED AND SUPPORTING LABOR IS REDUCED.

650

(3706) TITLE - MFG/LDG TECH F/NORWEGIAN BASED PROJECTILES

PROBLEM - DEVELOP AND DEMONSTRATE A PROTOTYPE LAP LINE FOR RAUFLOSS-TYPE PROJECTILE CAPABLE OF APPROXIMATING US HIGH VOLUME TECHNIQUES WITHOUT DEGRADING PERFORMANCE.

SOLUTION - DEVELOP A HIGH VOLUME LAP LINE FOR THE RAUFLOSS-TYPE ROUND STARTING WITH DEVELOPMENT OF HANDLING INSPECTION AND PRESS LOADING FOR DIFFERENT HIGH EXPLOSIVES AND INCENDIARY MIXES AND PROGRESSING TO HIGH VOLUME DEMONSTRATION.

700

MMT FLVE YEAR PLAN  
RCS DRCHT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- LOAD

(CONTINUED)

(3720) TITLE - MFG PROCESSES F/LAP OF UNDERWATER MINE SYS. (UMS)

500

(3721) TITLE - MFG PROCESS F/LAP OF IMPROVED MINE SYSTEM

500

(3722) TITLE - MFG PROCESSES F/LAP OF OFF-ROUTE ANTITANK MINE SYSTEM

700

(3723) TITLE - MFG PROCESS F/LAP OF THE GUIDED ANTIARMOR MORTAR PROJECTILE

1000

(3728) TITLE - MFG PROCESSES F/WIDE AREA SPRAY SYSTEM (SPRAY FAE)

350

(3733) TITLE - MFG PROCESSES F/ADV DET DESIGNS

250

(3735) TITLE - MFG PROCESS F/WALL BREAKING CHARGE

250

(4078) TITLE - UPGRADE SAFETY READINESS AND PRODUCTIVITY OF EXIST MOLT POUR

900

600

300

PROBLEM - SIGNIFICANT IMPROVEMENT OF MOLT POUR FACILITIES IS NOT BEING REALIZED BECAUSE DESIGN APPROACHES FOR COST-EFFECTIVE INTERMEDIATE UPGRADING ARE NOT AVAILABLE.

SOLUTION - DEVELOP A SERIES OF PROCESS DESIGN CONCEPTS TO IMPROVE SAFETY, REDUCE EXPLOSIVE QUANTITIES, REMOVE PERSONNEL FROM HAZARDOUS AREAS, INCREASE EFFICIENCY AND REDUCE PRODUCTION COSTS. PROVIDE MODULAR DESIGN PKGS F/VARIOUS PROCESSES AND UPGRADING LEVELS.

(4086) TITLE - REPROCESSING EXPLOSIVE FINES AND DRILL SCRAP

621

PROBLEM - FINELY DIVIDED EXPLOSIVE SCRAP GENERATED IN CAVITY DRILLING AND RISER CRUSHING OPERATIONS IS CURRENTLY BURNED AS WASTE. IT CANNOT BE REPROCESSED IN ITS GENERATED STATE DUE TO HANDLING PROBLEMS AND AGGLOMERATION WHEN INTRODUCED INTO MOLT SYSTEMS.

SOLUTION - DEVELOP A SYSTEM TO SCREEN, INSPECT AND REPROCESS THE FINE EXPLOSIVE INTO FLAKE EXPLOSIVE THAT CAN BE EASILY TRANSPORTED AND DIRECTLY INTRODUCED INTO MOLT POUR SYSTEMS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- LOAD

(4373) TITLE - SILK SCREEN DEPOSITION OF PRIMARY EXPLOSIVES

PROBLEM - CURRENT NON-ELECTRIC DETONATOR FACILITIES, EQUIPMENT AND METHODS LACK VERSATILITY, PRESENT PROBLEMS IN QUALITY AND UNIFORMITY OF PRODUCT AND ARE COSTLY IN OPERATION AND MAINTENANCE.

SOLUTION - EVAL NEW IMPROVED OR MODIFIED EQUIPMENT AND TECHNIQUES FOR THE MASS PRODUCTION OF DETONATORS USING SILK-SCREEN TECHNIQUES WITH THE ULTIMATE GOAL OF MODERNIZING PRODUCTION FACILITIES.

730

(4497) TITLE - HANDLING EQUIPMENT FOR ADAM OVERLAYS

PROBLEM - THE ADAM PROPELLANT OVERLAY IS MANUALLY CONVEYED BETWEEN SIX MODULES. THE MANUAL CONVEYANCE IS SLOW AND EXPOSES PERSONNEL TO HAZARDOUS OPERATIONS.

SOLUTION - DEVELOP A MATERIAL HANDLING SYSTEM TO AUTOMATICALLY LOAD AND UNLOAD EACH STATION AND TO CONVEY PARTS BETWEEN STATIONS DURING THE WELDING AND FILLING OPERATION.

636

(4520) TITLE - DEV PROCESS FMPRESS LOADING ID5MM HEAT-MP-T, XM815 PROJ

PROBLEM - THE ID5MM XM815 WILL BE THE FIRST TANK ROUND TO USE A PRESSED SHAPED CHARGE. A PRODUCTION PROCESS FOR PRESS LOADING MUST BE ESTABLISHED EVALUATING SEVERAL CANDIDATE EXPLOSIVES AND ESTABLISHING TOOLING DESIGN AND PRESSING PARAMETERS.

SOLUTION - PROCESSING PROCEDURES WILL BE ESTABLISHED FOR CANDIDATE EXPLOSIVES AND A LIMITED NUMBER OF UNITS LOADED, TESTED, EVALUATED. PROCESS EQUIPMENT WILL BE IDENTIFIED SO THAT PROPER PRESS LOADING PROCEDURES MAY BE IMPLEMENTED INTO PRODUCTION.

589 468

(4524) TITLE - LOW VOLUME AUTO MELT-POUR EQUIP FOR LOADING SMALL AP MINES

PROBLEM - CURRENT EXPLOSIVE LOADING OF SMALL AP MINES IS ACHIEVED BY HIGHLY LABOR INTENSIVE OPERATIONS. LARGE VOLUME TECHNIQUES ARE NOT APPLICABLE BECAUSE OF LOW PLANNED PRODUCTION QUANTITIES.

SOLUTION - DEVELOP A LOW COST, LOW VOLUME AUTOMATED INJECTION MOLDING SYSTEM FOR MELT LOADING OF FASCAM MINES.

377 310

(4561) TITLE - FILL/CLOSE + LAP TECHNOLOGY FOR BINARY IVA MUNITIONS

PROBLEM - NEW IVA BINARY MUNITIONS WILL REQUIRE PROCESS BASELINE FOR DESIGN OF PRODUCTION FACILITIES TO FILL/CLOSE AND LAP THE ITEMS.

SOLUTION - MANUFACTURING PROCESSES WILL BE ESTABLISHED AND PROTOTYPE EQUIPMENT ACQUIRED TO PRODUCE THE IVA MUNITIONS.

899 481

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- PACK

(4568) TITLE - AUTO WEIGHING SYSTEM FOR PROPELLANTS

500

PROBLEM - ELECTRONIC CONTROLS FOR WEIGHING SYSTEMS DO NOT MEET THE NATIONAL ELECTRICAL CODE STANDARDS AND OPERATE PRESENTLY UNDER EXEMPTIONS TO THE CODE, PROCUREMENT IS CURRENTLY FROM A SOLE SOURCE.

SOLUTION - TO MODIFY AND SYNTHESIZE COMMERCIAL COMPONENTS INTO A LESS EXPENSIVE AND MORE RELIABLE SYSTEM WHICH CAN BE PURCHASED ON A COMPETITIVE BASIS AND NOT REQUIRE SAFETY WAIVERS.

COMPONENT --- SUPPORT

(0002) TITLE - IMPROVED AUTOMATED LAP MATERIAL HANDLING TECH

550

PROBLEM - MATERIAL HANDLING EQUIPMENT USED IN LINES AT LAP PLANTS IS GENERALLY OLD AND COSTLY TO OPERATE, MAINTAIN, AND SUPPORT.

SOLUTION - THIS PROJECT WILL EXPLORE STATE OF THE ART EQUIPMENT WITH EMPHASIS ON ADAPTATIONS REQUIRED FOR OPERATION IN AN EXPLOSIVE ENVIRONMENT.

COMPONENT --- TNT

(4200) TITLE - TNT CRYSTALLIZER FOR LARGE CALIBER

554

PROBLEM - TNT MELT LOADING REQUIRES AN OPTIMUM RATIO OF MOLTEN AND SOLID TNT IN THE EXPLOSIVE MIX AT THE TIME OF POUR. THE RATIO IS OBTAINED BY THE ADDITION OF FLAME TNT TO A QUANTITY OF MOLTEN TNT BASED ON OPERATOR JUDGEMENT.

SOLUTION - DEV A DEVICE WHICH UTILIZES MOLTEN TNT TO GEN A SLURRY CONSISTENCY THROUGH PARTIAL CONTROLLED, STEADY-STATE CRYSTALLIZATION. BY CLOSE CONTROL OF TNT FLOW RATE AND THERMAL PARAMETERS, A CONTINUOUS FINE GRAINED SLURRY MIX OF PROPER RATIO WOULD RESULT.

(4399) TITLE - INSTRU IN-PROCESS MEASUREMENTS OF SOLID LIQUID TNT

318

PROBLEM - NO ACCURATE REAL TIME CAPABILITY EXISTS TO MEASURE THE SOLID/LIQUID RATIO OF TNT SLURRIES CRITICAL FOR TNT LOADING OF MEDIUM AND LARGE CALIBER PROJECTILES. THIS RESULTS IN MARGINAL PROCESS CONTROL WITH A POTENTIAL FOR DEFECTIVE CASTS AND REWORK.

SOLUTION - DEVELOP REMOTELY OPERATED HIGHLY SENSITIVE INSTRUMENTATION TO MEASURE SLURRY SOLID/LIQUID PROPORTION DURING TNT LOADING OPERATIONS. THIS WILL PERMIT CLOSE CONTROL OF THE TNT PHYSICAL CHARACTERISTICS AND RESULT IN THE HIGHEST UNIFORM QUALITY POSSIBLE

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\* C A T E G O R Y \*  
\*-----\*  
\*METAL PARTS\*  
\*\*\*\*\*

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT --- CARTRIDGE CASES

(4542) TITLE - ULTRASONIC DEEP DRAWING OF CANNON STEEL CARTRIDGE CASES

PROBLEM - DEEP DRAWN STEEL CASES REQUIRE MULTIPLE DRAWS AND REQUIRE EXCESSIVE PROCESSING AND ENERGY VS BRASS.

SOLUTION - ULTRASONIC ACTIVATION OF FORMING DIES HAS POTENTIAL FOR REDUCING DRAWING FORCES AND ELIMINATING STEPS IN THE DRAWING PROCESS.

COMPONENT --- FORMING/MACHINING

(2726) TITLE - LASER CUTTING SLOTS IN HARDENED STEEL STRUCTURES

PROBLEM - CURRENT TECHNOLOGY EMPLOYED TO FORM SLOTS IN HARDENED STEEL STRUCTURE OF VARYING THICKNESS IS SLOW AND COSTLY. A MORE COST EFFECTIVE TECHNIQUE IS REQUIRED.

SOLUTION - ADAPT STATE-OF-THE-ART MICROPROCESSOR CONTROLLED LASER CUTTING EQUIPMENT TO PRODUCE CLOSE TOLERANCED ORDNANCE CONFIGURATIONS IN HARDENED STRUCTURES.

(2731) TITLE - ULTRASONIC ASSISTED MACHINING

PROBLEM - DIFFICULT TO MACHINE MATERIALS REQUIRE REDUCED FEEDS AND SPEEDS AND INCREASED TOOL WEAR AND BREAKAGE ALL OF WHICH CONTRIBUTES TO INCREASED MACHINING COSTS.

SOLUTION - STUDIES SHOW THAT ULTRASONIC ACTIVATION OF CUTTING TOOLS RESULTED IN REDUCED LOADS AND WEAR WHEN CUTTING DIFFICULT TO MACHINE MATERIALS. ECONOMIC BENEFITS WILL BE ESTABLISHED BY APPLYING THE LAB METHODS TO REAL WORLD MACHINING SITUATIONS.

(3015) TITLE - IUD FOR DU CORES

PROBLEM - ACCELERATED CORROSION TESTING OF STABILLOY CORES HAS INDICATED A POTENTIAL CORROSION PROBLEM WITH UNCOATED STABILLOY CORES IN LONG TERM STORAGE. CONVENTIONAL COATING PROCESSES SUCH AS PAINTING AND ELECTROPLATING ARE NOT SATISFACTORY.

SOLUTION - INVESTIGATE ION VAPOR DEPOSITED COATINGS. DETERMINE EQUIPMENT REQUIREMENTS, INSPECTION AND TEST PROCEDURES, PROCURE A PIECE OF PRODUCTION EQUIPMENT, AND ESTABLISH PROCESS PARAMETERS.

(3703) TITLE - WASP SHAPED CHARGE LINER

PROBLEM - THE WARHEAD (WASP) SHAPED CHARGE LINER IS PROJECTED TO HAVE A DOUBLE CONTOUR WITH VARIABLE THICKNESS WALLS. MACHINING COSTS FOR THIS LINER COULD BE AS MUCH AS \$250 IN 'THEN-YEAR' DOLLARS.

SOLUTION - NO SOLUTION PROVIDED.

338 232

250 190

350

150

700

250

400

500

FUNDING (\$DDO)

PRIOR 82 83 84 85 86

COMPONENT --- FORMING/MACHINING

(CONTINUED)

(3712) TITLE - PRODUCTION BASE FOR NOVEL SHAPED CHARGE LINERS

250

PROBLEM - NEW SHAPED CHARGE MATERIALS BEING INVESTIGATED TO COMBINE HIGH MASS AND PYROPHORICITY WILL HAVE NO PRODUCTION BASE BECAUSE OF THE NATURE OF THE MATERIALS.

SOLUTION - A COMBINATION OF RHEOCASTING THE COMPOSITE AND PRESSURE CASTING TO REMOVE EXCESS LOW DENSITY MATERIAL CAN PRODUCE SHAPED STOCK FOR FURTHER WARM WORKING.

(3713) TITLE - EQUIP IDENT ? ASSESSMENT TO MAINTAIN A QUICK RESPONSIVE PDN

750

(4369) TITLE - IMPROVED PROJECTILE CAVITY SURFACE

545

PROBLEM - THE FORGING PROCESSES + TECHNIQUES CURRENTLY USED CAN CAUSE DEFECTS + IMPERFECTIONS ON THE CAVITY SURFACE. THIS CONDITION NEEDS CORRECTION TO PREVENT SENSITIVITY PROBLEM THAT CAN OCCUR WITH THE COMP EXPLOSIVE TO BE USED IN HE ROUNDS.

SOLUTION - INVESTIGATE THE VARIOUS OPERATIONS SUCH AS NICK AND BREAK BILLET SEPARATION, SCALE, TOOL WEAR OF FORGE, AND FOREIGN MATTER BUILD-UP. DETERMINE BEST PROCESS CHANGES.

(4380) TITLE - ABRASIVE MACHINING IN PROJECTILE MANUFACTURING

176 412

PROBLEM - NEW GENERATION OF PROJECTILES HAVE HIGH HARDNESS AND ARE MADE FROM ALLOY AND HIGH FRAGMENTATION STEELS. CONVENTIONAL MACHINING THESE ALLOYS REQUIRE SURFACE SPEEDS LOWER THAN NORMALLY EXPECTED WITH CARBON STEELS AND ARE CONSEQUENTLY HIGHER IN COST.

SOLUTION - ABRASIVE MACHINING TECHNIQUES CAN BE USED TO INCREASE THE METAL REMOVAL RATES WHEN MACHINING THE NEW GENERATION PROJECTILES MADE WITH HARD STEEL ALLOYS. THIS PROGRAM WILL INVESTIGATE BOTH RIGID AND FLEXIBLE SURFACE ABRASIVE MACHINING TECHNIQUES.

(4397) TITLE - FABRICATION OF ADVANCED WARHEADS

750

PROBLEM - MANUFACTURING PROCEDURES FOR ADVANCED WARHEADS NEED TO BE ESTABLISHED.

SOLUTION - STUDIES TO ESTABLISH AND OPTIMIZE THE MANUFACTURING PROCESS FOR ADVANCED WARHEADS.

(4519) TITLE - OUTLINE AUTOMATIC DETECTION OF TOOL WEAR

50 40

PROBLEM - TOOL WEAR ON SEMIAUTOMATIC METAL MACHINES CAUSE DEFECTIVE PARTS IF UNDETECTED.

SOLUTION - PROVIDE AN AUTOMATIC MEASURING DEVICE ON THE TRANSPORTER OF THE LOAD/ UNLOAD SYSTEM.



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- FORMING/MACHINING (CONTINUED)

(4528) TITLE - ROTARY FORGING OF DU PENETRATORS

493 976

PROBLEM - CURRENT FABRICATION TECHNIQUES FOR THE PRODUCTION OF DU PENETRATORS INVOLVE CONSIDERABLE MACHINING WITH ASSOCIATED HIGH COST AND WITH ACCOMPANYING PROBLEMS OF DISPOSAL OF THE RESULTANT MATERIAL SCRAP.

SOLUTION - APPLICATION OF ROTARY FORGING TECHNOLOGY TO THE FABRICATION OF NEAR NET SHAPE DU PENETRATORS RESULTING IN CONSIDERABLY LESS FINISH MACHINING AND SCRAP.

(4529) TITLE - MFG OF PRECISION CONES FOR HEAT PROJECTILES

525 418 514

PROBLEM - THE HEAT PROJECTILE LINER MUST BE HELD TO .003' IN ANY TRANSVERSE PLANE AND WITHIN .006' ALONG ITS LENGTH. THE TOLERANCES ARE AT THE EXTREME LIMIT OF ACCURACY. THE XM815 LINER REQUIRES PRECISION AN ORDER OF MAGNITUDE GREATER (.0005').

SOLUTION - PHASE ONE WOULD EXAMINE TWO CANDIDATE PROCESSES - SHEAR FORMING AND DRAW/ANNEAL. FIFTY ROUNDS WOULD BE TESTED BY EACH PROCESS. ONE CANDIDATE PROCESS WILL BE CHOSEN FOR FURTHER DEVELOPMENT DURING THE SECOND PHASE.

COMPONENT --- PROJECTILES

475

(3209) TITLE - POWDERED METAL (PM) FOR LOW DRAG 20-40MM PROJECTILES

PROBLEM - LOW DRAG PROJECTILES REQUIRE SIGNIFICANT AMOUNT OF MACHINING AND INSPECTION. CONSEQUENTLY, EACH PROJECTILE IS EXPENSIVE AND THE PROCESS SEVERELY LIMITS PRODUCTION RATES.

SOLUTION - PM MANUFACTURING TECHNIQUES MAY INCREASE PRODUCTION RATES WHILE REDUCING COST. A SECONDARY COINING OPERATION MAY OR MAY NOT BE REQUIRED; HOWEVER, THE TOTAL MACHINING OPERATION IS REDUCED TO, AT MOST, TWO.

(3736) TITLE - MFG PROCESSES F/SMART TARGET FIRE AND FORGET PROJ (STAFF)

500

(3741) TITLE - MFG PROCESSES F/ADV DESIGN ARTILLERY TRAINING AMMUNITION

1000

(3745) TITLE - IMPROVED TECH F/MFG OF 8' FIN STABILIZED ART PROJ (CHAMP)

500

(3747) TITLE - TECHNOLOGY F/MFG OF ADVANCED 75MM AMMUNITION

1000

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- PROJECTILES

(CONTINUED)

(4189) TITLE - HIGH FRAGMENTATION STEEL PRODUCTION PROCESS

1807 1697

PROBLEM - THE CURRENT PRODUCTION PROCESS FOR MANUFACTURING HFI PROJECTILES IS EXTREMELY EXPENSIVE. PROPRIETARY PRODUCTION PROCESSES DEVELOPED BY PRIVATE INDUSTRY ARE NOT AVAILABLE.

SOLUTION - EXAMINE NEW AND IMPROVED PRODUCTION PROCESSES FOR REDUCTION OF STARTING MULTI-WEIGHT, MACHINING TECHNIQUES, ANNEALING FORGINGS, ONE-HIT HOT NOSING, HEAT TREATING AND FRACTURE TOUGHNESS. WILL COMPLETE A TDP FOR COMPETITIVE PROCUREMENT.

(4517) TITLE - PROCESS FOR RECYCLING STABALLOY MACHINING CHIPS

824

PROBLEM - STABALLOY CHIPS ARE PYROPHORIC AND MUST BE DISPERSED IN AN INERT MATERIAL TO BE DISPOSED OF BY BURIAL AS A RADIOACTIVE MATERIAL. RECYCLING INTO USABLE METAL WOULD SOLVE DISPOSAL PROBLEMS.

SOLUTION - CONTINUE EFFORT INITIATED IN FY80 W/REDIRECTED FY79 FUNDS. VARIOUS APPROACHES TO CHIP RECYCLING ARE BEING EXPLORED. ONE APPROACH SHOWING MOST ADVANTAGES WILL BE SELECTED FOR FURTHER OPTIMIZATION IN FY83.

(4553) TITLE - PROCESS PARAMETERS FOR COLD DRAWING ALLOY STEELS

216 284

PROBLEM - THE USE OF MORE HIGHLY ALLOYED STEELS TO MEET PROPERTY REQUIREMENTS MAY NEGATE USE OF COLD DRAW PROCESS, WITH RESULTANT COST INCREASES.

SOLUTION - DEVELOP THE NECESSARY PROCESSING PARAMETERS TO ENABLE CONTINUED USE OF COLD DRAW PROCESS ON HIGH PERFORMANCE STEELS.

(4597) TITLE - MFG PROC F/CANNON CALIBER DU PENETRATOR (20MM, 25MM, 30MM)

380 460

PROBLEM - CURRENT FABRICATION TECHNIQUES FOR SMALL CALIBER DEPLETED URANIUM PENETRATORS RESULT IN EXCESSIVE SCRAP OF RADIOACTIVE CONTAMINANTS AND ARE HIGHLY LABOR INTENSIVE.

SOLUTION - DEFINE A FULL PRODUCTION PROCESS AND EQUIPMENT FOR THE MANUFACTURE OF DU PENETRATORS DIRECT FROM ROLLED BAR BY SKEWED AXIS ROLL FORMING TECHNIQUES.

COMPONENT -- TOOLING

(3707) TITLE - WELDING TECHNOLOGY ADVANCEMENTS (AF83-7)

300

PROBLEM - FAB AND MAINT COSTS OF TOOLING FIXTURES; TOOLING AND PART SAFETY FOR RESISTANCE AND TIG WELDING; EXTENSIVE WELDING SCHEDULES, TESTING, AND STRIP REQUIREMENTS FOR TAPERED MATERIALS ARE COST DRIVERS OF COMPONENTS FOR MISSILE AND ROCKET MOTOR.

SOLUTION - EVALUATE THE DESIGN AND MATERIALS OF CONSTRUCTION OF SHORT BARS, DEVELOP NEW TECHNIQUE UTILIZING LOW HEAD PRESSURES. THE DEVELOPMENT OF A WELDING MACHINE AND/OR PROCESS TO PERMIT VARIABLE SCHEDULES AND WELD SAMPLES WHILE IN OPERATION.

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT -- TOOLING

(CONTINUED)

(4164) TITLE - ANALYSIS FOR PREDICTING FAILURE OF MFG TOOLING

PROBLEM - THE ABILITY TO PREDICT FAILURE OF MACHINE OR COMPONENTS IS NON-EXISTANT. FAILURES ARE COSTLY AND REDUCE PRODUCTION OUTPUT.

SOLUTION - FREQUENCY ANALYSIS WILL IDENTIFY MACHINE PARTS WHICH ARE DEFECTIVE, OVERLOADED, OR NOT OPERATING PROPERLY.

132 163

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\* C A T E G O R Y \*  
\*-----\*  
\*POLLUTION ABATEMENT \*  
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COMPONENT -- CHEMICAL

(4298) TITLE - EVALUATION OF DMN DISPOSAL ON HSAAP B-LINE

PROBLEM - EFFLUENT FROM AMONIA RECOVERY COLUMN CONTAINS SIGNIFICANT AMOUNTS OF DMN. DMN IS ONE OF THE EPA CONSENT DECREE COMPOUNDS FOR WHICH WATER QUALITY CRITERIA MUST BE PROVIDED. EPA INSISTS ON LEVELS BELOW 0.3 PPB.

SOLUTION - EVALUATE UV PHOTOLYSIS CATALYTIC HYDROGENATION, CARBON ADSORPTION OR OTHER TECHNIQUES FOR ABATING OR DESTROYING DMN.

472 391 295

COMPONENT -- GENERAL

(4226) TITLE - ON-LINE MONITORS FOR WATER POLLUTANTS

PROBLEM - IDENTIFICATION AND MONITORING OF INDIVIDUAL MILITARY UNIQUE EFFLUENT POLLUTANTS REQUIRED BY WATER POLLUTION CONTROL ACT.

SOLUTION - DEMONSTRATE PROTOTYPE CONTINUOUS MONITORS DEVELOPED UNDER R7D PROGRAM BY FIELD TESTS ON AAP WASTEWATER EFFLUENT DISCHARGE STREAMS.

537 426

(4231) TITLE - IN-PLANT REUSE OF POLLUTION ABATED WATERS

PROBLEM - MORE STRINGENT STANDARDS FOR MILITARY UNIQUE POLLUTANTS. 1985 GOAL OF ZERO DISCHARGE. EXPENSE OF TREATING POLLUTION. CONTINUE THIS REUSE OF TREATED WATER IN OTHER PROCESSES.

SOLUTION - THIS PROJECT CONCENTRATES EFFORT IN RECYCLING OF TREATED WASTE WATER WITH THE ULTIMATE GOAL OF COMPLYING WITH THE ZERO DISCHARGE GUIDELINE.

704 313

(4348) TITLE - NOISE POLLUTION ABATEMENT F/SCAMP IN LCAAP

PROBLEM - NOISE LEVEL EXCEEDS 85 DBS IN BLDG 1 AT LAKE CITY AAP.

SOLUTION - INSTALL RECOMMENDED ONE SUBMODULE NOISE SUPPRESSION SYSTEM AND EVALUATE ALL OTHER SUBMODULES.

264

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- GENERAL

(CONTINUED)

(4364) TITLE - ON-LINE BIO SENSORS TO MONITOR MIXED WASTE STREAMS

258 290

PROBLEM - PL92-50D REQUIRES THAT WASTE DISCHARGES BE MONITORED TO ASSURE THAT AQUATIC LIFE ARE PROTECTED FROM TOXIC/HAZARDOUS SUBSTANCES. IN ADDITION, BIOLOGICAL MONITORING WILL SOON BE REQUIRED IN SOME NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS.

SOLUTION - USE A BIOLOGICAL MONITORING SYSTEM TO EVALUATE TOXIC EFFECTS. FROM CORRELATIONS BETWEEN CHEMICAL CONSTITUENTS IN THE WASTE WATER AND BIOLOGICAL RESPONSES, EXPENSIVE CHEMICAL MONITORING MIGHT BE ELIMINATED.

COMPONENT --- PROPELLANTS/EXPLOSIVES

(4229) TITLE - ADVANCED PINK WATER TREATMENT

460

PROBLEM - CURRENT PINK WATER DISPOSAL TECHNOLOGY THROUGH CARBON ADSORPTION IS HIGH IN COST EVEN WHEN REGENERATION TECHNIQUE IS UTILIZED.

SOLUTION - ALTERNATIVE TECHNOLOGIES ARE AVAILABLE WHICH CAN REDUCE THIS TREATMENT BY 50 PERCENT. IT IS LIKELY THAT A HYBRID SYSTEM WILL BE DEVELOPED THAT CAN BE RETOFTITTED TO THE CURRENT SYSTEMS.

(4295) TITLE - TERTIARY TREATMENT OF HOLSTON WASTE WATER

85

PROBLEM - FACILITY PROJECT AT HOLSTON REQUIRES TERTIARY TREATMENT TO MEET DISCHARGE STANDARDS FOR NITROBODIES. CARBON ADSORPTION OR A HYBRID TREATMENT SYSTEM IS NEEDED.

SOLUTION - THIS PROJECT WILL COMPLETE PILOT WORK TO ESTABLISH DESIGN CRITERIA AND OBTAIN DATA FOR THE TERTIARY TREATMENT SYSTEM.

(4489) TITLE - ADVANCED POLLUTION ABATEMENT FOR DARCOM FACILITIES

1359 1224

PROBLEM - MUCH WORK HAS BEEN DONE IN THE PROPELLANTS AND EXPLOSIVES PLANTS TO MEET THE POLLUTION ABATEMENT STANDARDS. HOWEVER, ALL OF THE GOALS HAVE NOT YET BEEN MET.

SOLUTION - DEVELOP TECHNOLOGY TO DISPOSE OF WASTEWATER TREATMENT SLUDGE, TO PROVIDE TERTIARY TREATMENT OF HAAP WASTEWATER, TO TREAT PINK WATER, AIR EMISSION AND DETONATOR WASTE, AND TO PROVIDE ENVIRONMENTAL IMPROVEMENTS FOR NITRATE ESTERS.

(4511) TITLE - DISPOSAL OF FJNL SLUDGE FROM ACID RECOVERY OPERATIONS

304 582 478

PROBLEM - RECOVERY OF SODIUM NITRATE AFTER HMXRDX PROD AT HSAAP IS COSTLY AND CAUSES POLLUTION. SODIUM NITRATE RESULTS BECAUSE SODIUM HYDROXIDE IS USED IN THE ACID PLANT TO NEUTRALIZE RESIDUAL NITRIC ACID AND EXPLOSIVES IN THE SPENT ACID.

SOLUTION - USE AMMONIA IN THE FORM OF AMMONIUM ACETATE TO NEUTRALIZE EXCESS NITRIC ACID. AMMONIUM NITRATE SLUDGE WILL BE CATALYTICALLY HYDROGENATED TO DESTROY OTHER RESIDUES. FINAL SOLUTION IS NH4ND3 IN WATER AND HAS A VALUE 4 TO 5 TIMES THAT OF SODIUM NITRATE.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- RECYCLE

(4344) TITLE - EST WASTE DISPOSAL TECH FOR M687 BINARY PROJ FAC

308 380

PROBLEM - LARGE QUANTITIES OF SOLID WASTES ARE GENERATED DURING DF MFG. THERE IS NO ACCEPTABLE DISPOSAL METHOD. DRUM STORAGE IS NOT FEASIBLE AND LANDFILL MAY REQUIRE SPECIAL PREPARATION.

SOLUTION - DEVELOP PROCEDURES FOR DECREASING THE AMOUNT OF SOLID WASTE GENERATED. RECOVER WASTES IN THE FORM OF LIQUID HCL WHICH CAN BE USED IN THE CENTRAL LWT FACILITY AND RECYCLE STILL BOTTOMS WHICH WILL REDUCE SOLID WASTES BY 80 PERCENT.

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\* C A T E G O R Y \*  
\*-----\*  
\* PROPELLANTS \*  
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COMPONENT -- BALL

(4540) TITLE - CALCIUM CARBONATE COATING OF 7.62MM BALL PROPELLANTS

292 87

PROBLEM - A SAFE AND EFFICIENT PROCESS IS NOT CURRENTLY AVAILABLE FOR THE COATING OF 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.

SOLUTION - UTILIZE AN EXISTING TWO-STAGE CONTINUOUS PILOT SCALE COATER AT OLIN'S ST. MARKS, FL FACILITY TO DEVELOP A SAFE AND EFFICIENT PROCESS TO COAT 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.

(4588) TITLE - SMALL CAL AUTOMATED NON-DESTRUCTIVE TEST - SCANT

880 1454 1019

PROBLEM - .50 CALIBER BALL, TRACER, ARMOR PIERCING INCENDIARY(API) AND ARMOR PIERCING INCENDIARY TRACER(APIT) AMMUNITION IS INSPECTED USING MM II GAGE AND WEIGH MACH AND VISUAL EXAM. THIS PROCESS IS SLOW, INACCURATE AND EXPENSIVE

SOLUTION - AUTOMATE THE GAGE + WEIGH PROCESS USING THE TECHNOLOGY DEVELOPED FOR 5.56MM. THE TECHNOLOGIES FOR THIS AUTOMATED PROCESS INCLUDE- OPTICS/ELECTRONICS, LASER SCATTERING, EDDY CURRENT, AND X-RAY. THE PROCESS WILL BE COMPUTER CONTROLLED.

COMPONENT -- GENERAL

(4145) TITLE - CONTROL DRYING IN AUTO SB AND BALL PROP MFG

327 553

PROBLEM - OFF-LINE ANALYSIS FOR MOISTURE AND VOLATILES MAKES IT DIFFICULT TO CONTROL A CONTINUOUS DRYING OPERATION SINCE THE TIME REQUIRED FOR ANALYSIS IS LONG COMPARED TO THE RESIDENCE TIME FOR THE PROPELLANT IN A CONTINUOUS DRYER.

SOLUTION - USE PRODUCT TEMPERATURE AND/OR ON-LINE ANALYZERS AND FLOW METERS AS A BASIS FOR IMPROVED CONTROL OF A CONTINUOUS DRYING OPERATION AND REDUCE THE AMOUNT OF OFF-LINE ANALYSIS REQUIRED.

MMT FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- GENERAL

(CONTINUED)

(4273) TITLE - AUTO PRODUCTION OF STICK PROPELLANT

PROBLEM - PRESENT BATCH TECHNIQUES FOR STICK PROPELLANT MFG INVOLVE MUCH HAND LABOR THEREBY RESULTING IN LIMITED PRODUCTION CAPACITY, HIGH COST, AND HAZARD EXPOSURE.

SOLUTION - INSTALL AND EVALUATE PROTOTYPE EQUIPMENT TO AUTOMATICALLY PRODUCE RACKED SOLVENT-TYPE STICK PROPELLANT, WHICH WILL BE CUT BY FLUID JET CUTTER. THIS PROCESS WILL OPERATE WITH EXISTING 12 INCH PRESS AND PRESS BAY.

(4533) TITLE - LOVA PROPELLANT PROCESSING

PROBLEM - VUL OF PROP TO VAR ATTACK FORCES CONTRIB MAJOR PORTION OF PROBABILITY OF LOSING A FIRING VEHICLE. VUL OF BULK PROPELLANT IN COMPLETE ROUND ASSEMBLY, STORAGE OR TRANSPORT IS ALSO A PROBLEM. THIS CHARAC IS INHERENT IN CURRENT MULTIBASE FORMULATION

SOLUTION - DETERMINE HAZARD CLASSIFICATION OF MATERIALS USED TO MANUFACTURE LOW VULNERABILITY (LOVA) PROPELLANTS AND ANALYZE THEIR INFLUENCE ON FACILITIES SELECTION AND NEED. CONDUCT BENCH SCALE INVESTIGATIONS ON POLLUTION ABATEMENT AND SOLVENT RECOVERY.

COMPONENT --- MISCELLANEOUS

(1019) TITLE - CONVERSION OF SURPLUS PENTABORANE TO B10

309

PROBLEM - THE DIBORANE (B2) USED IN THE MANUFACTURE OF DECABORANE (B10) IS A COST DRIVER.

SOLUTION - DEVELOP A PROCESS TO MIX GOVERNMENT OWNED PENTABORANE (B5) WITH B2 TO REDUCE THE COST OF THE PRODUCT B10.

COMPONENT --- MULTI-BASE

(4531) TITLE - CONTINUOUS PRODUCTION OF NEW PROPELLANTS ON CAMBL

PROBLEM - VARIOUS HIGH ENERGY AND LOVA GRANULAR AND STICH MULTI-BASE PROPELLANTS ARE BEING DEVELOPED. BATCH FACILITIES FOR MULTI-BASE PROPELLANTS HAVE A CONSTRAINED CAPACITY. A NEW CAMBL HASNT BEEN PROVEN ACCEPTABLE ON THE NEWER PROPELLANTS.

SOLUTION - ADAPT RECENTLY DEVELOPED CAMBL PROCESS TO DEMONSTRATE THE MASS PRODUCIBILITY OF THE NEW PROPELLANTS. THIS WILL INSURE A PRODUCTION BASE FOR THE NEW FORMULATIONS AND PREVENT HAVING TO USE AND/OR BUILD INEFFICIENT BATCH FACILITIES.

838 928 514

400 1140 875 845

246 951 926



FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- MULTI-BASE

(4544) TITLE - DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS

407 313

PROBLEM - STANDARD BALLISTIC EVALUATION TESTS ARE THE ONLY MEANS AVAILABLE FOR ASSESSING PROPELLANTS FOR HIGH PRESSURE/HIGH VELOCITY SYSTEMS SUCH AS THE 105MM AND 120MM TANK GUNS. THESE PROCEDURES ARE VERY EXPENSIVE AND TIME CONSUMING.

SOLUTION - DEVELOP A THIRD GENERATION DYNAGUN WHICH CAN BE USED IN LIEU OF STANDARD BALLISTIC TESTS AS A MORE RAPID AND LESS COSTLY MEANS OF ASSESSING PROPELLANTS FOR THE 105MM AND 120MM TANK GUNS.

(4572) TITLE - IMPROVED BATCH PROCESSING OF MULTI BASE PROPELLANTS

414 951 850

PROBLEM - BATCH MANUFACTURE OF MULTI-BASE PROPELLANTS REQUIRES MANY OPERATIONS WHICH ARE LABOR INTENSIVE DIFFICULT TO CONTROL AND HAZARDOUS TO THE OPERATORS.

SOLUTION - PROVIDE PROTOTYPE EQUIPMENT TO IMPROVE, SIMPLIFY AND COMBINE OPERATIONS IN BATCH PROCESSING OF MULTI-BASE PROPELLANTS BOTH GRANULAR AND STICK TO REDUCE COST AND OPERATOR HAZARD.

COMPONENT -- NITROGUANIDINE

(4061) TITLE - NITROGUANIDINE PROCESS OPTIMIZATION

1400 1150 940

PROBLEM - A NITROGUANIDINE FACILITY IS UNDER CONSTRUCTION AT SAAP TO BE OPERATIONAL IN FY80. IT UTILIZES PROCESSES NOT PREVIOUSLY USED COMMERICALLY AND IT CONTAINS MANY RECIRCULATION AND SUPPORT LOOPS, THE OPERATION OF WHICH ARE STRONGLY INTERDEPENDENT.

SOLUTION - CONDUCT PROCESS IMPROVEMENT PROCEDURES USING NITROGUANIDINE SUPPORT EQUIPMENT (NSE) INSTALLED UNDER PROJECT 5752632, AND APPLY EVOLUTIONARY OPERATION (EVUP) TO THE NITROGUANIDINE FACILITY BEING CONSTRUCTED AT SUNFLOWER APP.

(4427) TITLE - ON-LINE ANALYZERS FOR NITROGUANIDINE PLANT

405 600

PROBLEM - A NITROGUANIDINE MFG FACILITY IS BEING CONSTRUCTED AT SUNFLOWER AAP. MMT 5 78 447 INDICATED THE FEASIBILITY OF AUTOMATED ON-LINE INSTRUMENTATION FOR PROCESS STREAM CHEMICAL ANALYSIS. HOWEVER THE RELIABILITY HAS NOT BEEN DEMONSTRATED.

SOLUTION - INSTALL AND EVALUATE AN ON-LINE ION CHROMATOGRAPH, A GAS CHROMATOGRAPH, AND A SPECTROPHOTOMETER IN THE NQ SUPPORT EQUIPMENT WHICH IS TO BE OPERATED DURING FY82 UNDER MMT 5 8X 4061, NQ PROCESS OPTIMIZATION.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- SINGLE BASE

(4027) TITLE - SOLVENT RECOVERY/DRYING OF SINGLE BASE PROPELLANTS

63 513 569

PROBLEM - PRESENTLY SOLVENT RECOVERY, WATER DRY, AND AIR DRY OPERATIONS ARE ACCOMPLISHED IN 3 SEPARATE TANKS, ONE TANK IS USED FOR EACH OPERATION. THESE OPERATIONS ARE BOTH LABOR AND ENERGY INTENSIVE AND GENERALLY INEFFICIENT.

SOLUTION - COMBINE THE 3 SEPARATE OPERATIONS INTO ONE COMBINED OPERATION TO TAKE PLACE IN ONE MODIFIED SOLVENT RECOVERY TANK. THIS APPROACH WILL RESULT IN A SIGNIFICANT SAVINGS IN BOTH LABOR AND ENERGY.

(4573) TITLE - COMBINED CPD, MIX AND EXTRUSION FOR S.B. PROPS

350 950 850

PROBLEM - BATCH MANUFACTURE OF SINGLE BASE PROPELLANTS REQUIRES OPERATIONS WHICH ARE LABOR INTENSIVE, DIFFICULT TO CONTROL AND HAZARDOUS TO THE OPERATORS.

SOLUTION - THIS PROJECT WILL PROVIDE PROTOTYPE EQUIPMENT TO IMPROVE, SIMPLIFY AND COMBINE OPERATIONS IN BATCH PROCESSING OF SINGLE BASE PROPELLANTS TO REDUCE COST AND OPERATOR HAZARDS.

COMPONENT -- SOLVENTLESS

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\* C A T E G O R Y \*  
\*-----\*  
\*QUALITY CONTROL/TESTING\*  
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COMPONENT -- INSPECTION

(3717) TITLE - APPLICATION OF RAPID X-RAY TECHNIQUE

2100

PROBLEM - IN HIGH G SHELL IT IS IMPORTANT THAT THERE ARE NO RESIDUAL STRESSES AFTER MANUFACTURE TO INSURE NO MALFUNCTIONS DURING FIRING OVER FRIENDLY FORCES.

SOLUTION - COUPLE APPLICABLE ELECTRONICS AND A COMPUTER TO A CONVENTIONAL X-RAY GENERATOR TO PRODUCE ACCURATE STRESS DETERMINATION ON A CONTINUOUS PRODUCTION LINE.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- INSPECTION

(CONTINUED)

(3718) TITLE - CONTINUOUS EVALUATION OF THE PROTECTIVE COATINGS

1800

PROBLEM - ARTILLERY SHELLS ARE GIVEN PROTECTIVE COATINGS AND SAMPLES FROM EACH LOT ARE EVALUATED DURING PRODUCTION IN THE STANDARD ASTM B117 SALT SPRAY TEST (REQUIRES 2-4 DAYS).

SOLUTION - CONTINUOUS SCANNING PROBE IMPEDANCE TECHNIQUES WILL PERFORM 100 PCT PROTECTIVE COATING CHECKS.

(4357) TITLE - FLUX LEAKAGE INSPECTION SYSTEM FOR M483

554 124

PROBLEM - THERE IS NO NONDESTRUCT INSPECTION METHOD WITH FLOW DETECTION RELIABILITY ESTAB F/M483. A MAGNETIC FLUX LEAKAGE DEVICE PURCHASED F/LOUISIANA AAP DEMONSTRATED FEAS BUT COST OF OPERATION MUST BE DETERMINED.

SOLUTION - DESIGN DEVELOP AND FABRICATE A PROTOTYPE MFL INSP SYS + EVALUATE RELIABILITY + OPERATING COST COMPARED TO ULTRASONIC INSPECTION SYSTEMS.

(4358) TITLE - AUTO LINE - PROCESS INSPECTION OF NEW EED'S (ALPINE)

295 835

PROBLEM - INSPECTION OF BRIDGE WIRE ON ELECTRIC DETONATORS.

SOLUTION - AUTOMATE THE TESTING TECHNOLOGY DEVELOPED BY TIT ARRADCOM 12-78, 'ELECTROTHERMAL ANALOG RESPONSE INSPECTION OF EED'S' FOR FINAL END ITEM NONDESTRUCTIVE ACCEPTANCE INSPECTION.

(4359) TITLE - IMPROVE PROCESS TECHNOLOGY F/INSPECTION OF CLOTH

215

PROBLEM - REDUCE TIME AND COST OF VISUAL INSPECTION OF CLOTH USED IN PROPELLANT BAGS, FLASH REDUCERS, ADDITIVE LINERS AND IGNITER PADS.

SOLUTION - IMPLEMENT EQUIP PROVEN FEASIBLE. PROCURE + INSTALLATION OF MOD STATE-OF-ART SENSORS THAT WILL MARK LOCATION OF CLOTH DEFECTS DURING SLITTING OPERATION. CLOTH WILL BE REMOVED + DISCARDED PRIOR TO SUBSEQUENT SEWING OPERATIONS.

(4471) TITLE - CONICAL SURFACE INSPECTION

337 197

PROBLEM - NO SATISFACTORY AUTOMATED INSPECTION EQUIPMENT IS KNOWN TO ACCOMPLISH THE VARIOUS CONICAL SURFACE INSPECTIONS FOR CONVENTIONAL AND ADVANCED SHAPED CHARGE LINERS.

SOLUTION - PROVIDE AN AUTOMATED INSPECTION SYSTEM COMPATIBLE WITH PROPOSED CONVENTIONAL AND SHAPED CHARGE TECHNOLOGY PROGRAMS. SPECIFICALLY FOR CONICAL SURFACE MEASUREMENTS.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- NON-DESTRUCTIVE TESTING

(3719) TITLE - APPLICATION OF X-RAY SYSTEM SCANNER 100 PCT

2200 4100

PROBLEM - IN THE CURRENT METHOD OF TESTING THE METALLURGICAL PROPERTIES OF SHELL, DESTRUCTIVE SAMPLES MUST BE TAKEN CONTINUOUSLY IN PRODUCTION

SOLUTION - DEVELOP A RAPID AND EFFECTIVE NOT METHOD TO CONTINUOUSLY VERIFY THE TENSILE AND HARDNESS PROPERTIES OF EACH SHELL PRODUCED.

(4473) TITLE - AUTO LEAK DETECTION OF WP MUNITIONS

410 230 220

PROBLEM - THE CURRENT METHOD OF HEATING THE WHITE PHOSPHOROUS MUNITIONS TO CHECK FOR LEAKS IS LABOR INTENSIVE AND IS NOT UNIFORM FOR ALL ROUNDS.

SOLUTION - PROVIDE A PROTOTYPE AUTOMATED IN-LINE LEAK DETECTION SYSTEM BASED ON QUANTITATIVE FLAME PHOTOMETRY. THE SYSTEM WILL CONSIST OF TWO HEATING STAGES, A SAMPLING WHEEL, LEAK DETECTOR AND HANDLING SYSTEM.

(4546) TITLE - NOT FOR BONDED AREAS OF 60/80MM MORTAR INCREMENT CONTAINERS

175 175

PROBLEM - LACK OF NONDESTRUCTIVE TEST OR INSPECTION OF THE BONDING OF THE CONTAINER HALVES AND THE CLOSURE OF FILLING HOLE.

SOLUTION - DEVELOP NOT AND EQUIPMENT FOR AUTOMATIC 100 PERCENT INSPECTION OF THE INCREMENT CONTAINER BONDED AREA. THE FEASIBILITY OF OPTICS TECHNOLOGY WILL BE INVESTIGATED FOR PRACTICALITY WHICH WILL BE FOLLOWED BY EQUIPMENT DESIGN AND FABRICATION.

COMPONENT -- SIMULATION

(2856) TITLE - SHOCK IMPULSE HYDROSTATIC TESTING

205

PROBLEM - BALLISTIC ACCEPT TEST OF METALLIC CARTRIDGE CASES UTILIZES 100 SAMPLE ITEMS LOADED INTO COMPLETE ROUNDS + FIRED AT A PG. THIS TEST CONSTITUTES APPROX 50 PERCENT OF ALL BALLISTIC ACCEPT TEST DONE ON ENTIRE ROUND REQUIRED TO PRODUCE ROUND.

SOLUTION - A SHOCK IMPULSE HYDROSTATIC PRESSURE TESTER DEV TO TEST COMPONENT CARTRIDGE CASE IN-PLANT W/O NEED OF ASSEMBLING INTO A FULL-UP ROUND WHILE STILL SIMULATING INTERIOR BALLISTIC PULSE WILL MINIMIZE EXPENSE OF TESTING BALLISTICALLY.

COMPONENT -- X-RAY

(4454) TITLE - AUTOMATIC INSPECTION DEVICE EXPLOSIVE CAST IN SHELL

5406 1522

PROBLEM - THE PRESENT METHOD OF INSPECTION LOADED PROJECTILE UTILIZES A STANDARD RADIOGRAPHIC FILM METHOD. LABOR AND MATERIAL (FILM) ARE COSTLY. DETERMINATION OF CRITICAL DEFECT IS SUBJECT TO HUMAN JUDGEMENT, FATIGUE, AND ERROR.

SOLUTION - DEVELOP PROTOTYPE SYSTEM USING A MINI-COMPUTER TO ANALYZE X-RAY IMAGES TO AUTOMATICALLY ACCEPT OR REJECT GROUPS OF HE FILLED PROJECTILES. DEVELOP A PROTOTYPE FILMLESS REAL-TIME AUTOMATED INSPECTION SYSTEM.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- X-RAY (CONTINUED)

(4545) TITLE - DIGITAL IMAGE AMPLIFICATION X-RAY SYSTEM

1121 395

PROBLEM - EXISTING IMAGE AMPLIFICATION X-RAY DOES NOT MEET THE IMAGE QUALITY CRITERIA TO BE USED AS AN INSPECTION TOOL FOR HE MORTAR ROUNDS. FILM RADIOGRAPHY, AS CURRENTLY USED, IS LABOR INTENSIVE, TIME CONSUMING, AND SUBJECT TO HUMAN INTERPRETIVE JUDGEMENT.

SOLUTION - REPLACE WITH AN IMPROVED REAL-TIME IMAGE AMPLIFICATION SYSTEM. TECHNIQUES FOR DIGITAL IMAGE ENHANCEMENT AND ANALYSIS DEVELOPED UNDER THE AXIS PROJECT WILL BE ADOPTED.

\*\*\*\*\*  
\* CATEGORY \*  
\*-----\*  
\* SAFETY \*  
\*\*\*\*\*

COMPONENT -- GENERAL

(2741) TITLE - LIGHTNING WARNING SYSTM FOR MUNITION PLANT SAFETY

150

PROBLEM - AS THE ELECTRONICS ADOPTED IN THE DESIGN OF AAP'S BECOMES MORE SOPHISTICATED AND COSTLY, THE NEED FOR QUICK AND RELIABLE LIGHTNING PROTECTION INCREASES.

SOLUTION - IMMEDIATE EVALUATION OF AUSTRALIAN (E.F. AUSTRALASIA) LIGHTNING PROTECTION SYSTEM AND SUBSEQUENT STATE OF THE ART ADVANCEMENT.

(4071) TITLE - EXPLOS PREVENTION IN DRY DUST COLLECTION SYSTEMS

442

194

PROBLEM - POTENTIALLY HAZARDOUS CONDITIONS EXIST IN DRY DUST COLLECTION SYSTEMS THROUGHOUT THE MUNITIONS PRODUCTION BASE. PRESENT DATA ON DETONATION CHARACTERISTICS OF EXPLOSIVE, PROPELLANT OR PYROTECHNIC DUST ARE INCOMPLETE/INADEQUATE TO IMPROVE SAFETY.

SOLUTION - DEVELOP DATA TO ESTABLISH SAFE OPERATING PARAMETERS FOR DUST COLLECTION SYSTEMS. UTILIZE THESE DATA TO DEVELOP FAIL-SAFE COLLECTION SYSTEM DESIGNS WHICH PREVENT DUST EXPLOSIONS BY EMPLOYMENT OF PROPER VENTING, LIMITING IGNITION ENERGY, ETC.

(4291) TITLE - BLAST EFFECTS IN THE MUNITIONS PLANT ENVIRONMENT

382

1373

PROBLEM - MOST OF THE DESIGN EFFORT IS IN THE AREA OF LACE REINFORCED STRUCTURES FOR CLOSED IN AREAS TO AN EXPLOSION. WE MUST ATTEMPT TO UTILIZE COM CONSTRUCTION MATERIAL.

SOLUTION - TO STUDY CHARACTERISTICS OF THE BLAST ENVIRONMENT AND DETERMINE THE RESPONSE OF THE VARIOUS STRUCTURAL MATERIALS AND ELEMENTS SUBJECTED TO THESE LOADING.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- LAP

(4374) TITLE - EXPLOSIVE SAFETY SHIELDS

217

PROBLEM - ACRYLIC MATL IS USED AS A PROTECTIVE SHIELD ON LOADING LINES WHERE LOADING OF SMALL QUANT OF HIGHLY SENSITIVE EXPLOSIVE OCCURS - NO DATA ON BLAST CAP OF THE MATL IS AVAIL + WORK MUST BE DONE ON A CASE-BY-CASE BASIS.

SOLUTION - DETERMINE BLAST CAP OF ACRYLIC MATL'S + PREP DESIGN GUIDANCE F/FUTURE USE. TECH REPORTS FOR DESIGN GUIDANCE OF THIS TYPE OF PROTECTIVE SHIELDS WILL BE DEV TO PRECLUDE CASE-BY-CASE METHOD NOW USED.

COMPONENT -- PROPPELLANTS/EXPLOSIVES

(4285) TITLE - TNT EQUIV TESTING FOR SAFETY ENGINEERING

2440 251

PROBLEM - PRESENT CRITERIA FOR BLAST RESISTANT STRUCTURES IS IN TERMS OF SURFACE BURST OF HEMISPHERICAL TNT. IN STRUCTURAL DESIGN, TO PROTECT FROM THE OUTPUT OF OTHER ENEGETICS, THE DESIGNERS MUST HAVE DATA PERTINENT TO THE MATERIAL IN QUESTION.

SOLUTION - BY TESTING TO GENERATE PEAK PRESSURE AND POS IMPULSE DATA FROM BLAST MEASUREMENTS OF HIGH ENERGY MATERIALS IS GENERATED. THESE RESULTS ARE COMPARED WITH THE BLAST OUTPUT OF HEMISPHERICAL TNT TO DETERMINE THE TNT EQUIVALENCY OF THE MATERIAL.

(4318) TITLE - OCCUPATIONAL EXPOSURE TO NITRATE ESTERS IN MUNITION MFG

260 550

PROBLEM - THE THRESHOLD LIMIT VALUE FOR NITROGLYCERIN AND OTHER NITRATE ESTERS MAY BE REDUCED FROM 0.2 PPM TO 0.02 PPM. THIS COULD INVOLVE EXTENSIVE REDESIGN ON ALL FACILITY PROJECTS INVOLVING NG OR NITRATE ESTERS.

SOLUTION - UTILIZE MORE EFFECTIVE VENTILATION OR CHEMICAL ENTRAPMENT, REMOTE AUTOMATIVE OPERATIONS, DEVELOP PROTECTIVE CLOTHING AND AIR RESPIRATORS.

(4453) TITLE - PROPAGATION DISTANCE FOR ENERGETIC MATERIALS

213 209

PROBLEM - THE EXISTING SAFETY MANUAL (AMCR 385-100) HAS BECOME ANTIQUATED BY RECENT ADVANCES IN WEAPONS TECHNOLOGY. THERE IS A NEED TO UPGRADE ACCIDENTAL DETONATION SUPPRESSION CRITERIA.

SOLUTION - A SERIES OF PROPAGATION SUPPRESSION CRITERIA TESTS ON VARIOUS ENERGETIC MATERIALS WILL BE CONDUCTED. THE SAMPLE CONFIGURATIONS WILL SIMULATE STAGES OF END ITEM MANUFACTURE AND ASSEMBLY.



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- PROPELLANTS/EXPLOSIVES (CONTINUED)

(4558) TITLE - THERMAL DEHYDRATION PROCESS SAFETY AND OPERATIONAL REDESIGN 434

PROBLEM - THERMAL DEHYDRATIONS WERE EVALUATED UNDER 2 MMT PROGRAMS, ONE FOR CASBL AND ONE FOR CAMBL. A THIRD THERMAL DEHYDRATION WAS CONSTRUCTED FOR C-LINE, AND DURING PROVE-OUT, AN INCIDENT OCCURRED. THE EXACT SOURCE OF INITIATION WAS NOT DETERMINED BY INVESTIGATION BOARD.

SOLUTION - OBTAIN OPERATIONAL AND SAFETY DATA USING THE CAMBL PILOT LINE THERMAL DEHYDRATION TO DETERMINE ELECTROSTATIC AND OPERATIONAL PARAMETERS LEADING TO IN-PROCESS MATERIAL IGNITION AND ITS ELIMINATION IN ORDER TO ASSURE THE THERMAL DEHYDRATION TO BE A SAFE OPERATION.

(4565) TITLE - ULTRA HIGH SPEED FIRE PROTECTION SYSTEM 250 200

PROBLEM - SAFETY REG WACOMR 385-10D REQUIRES CERTAIN HAZARDOUS OPERATIONS TO BE EQUIPPED WITH FIRE PROTECTION SYSTEMS THAT CAN PROVIDE SUPPRESSANT ON FIRES WITHIN 50 MSEC FROM THE TIME OF THEIR DETECTION.

SOLUTION - A COMPREHENSIVE INVESTIGATION (INCLUDING TESTS) WILL BE CONDUCTED TO DETERMINE IF 50 MSEC REQUIREMENT IS REASONABLY ACHIEVABLE (BOTH TECHNICALLY AND ECONOMICALLY) ON PRACTICAL SYSTEMS USING EXISTING FIRE SUPPRESSANT TECHNOLOGY.

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\* C A T E G O R Y \*  
\*-----\*  
\* SMALL ARMS \*  
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COMPONENT -- GENERAL

(4351) TITLE - IMPROVED STORAGE TECHNOLOGY FOR PRODUCTION MACHINE 421 319

PROBLEM - NEED TO OVERCOME DEGRADATION OF ELECTRONIC COMPONENTS + MEET RAPID REACTIVATION OF AUTO PDN LINES F/MOB REQUIREMENTS.

SOLUTION - DEVELOP PACKAGING TECHNIQUE AND USE OF DRY NITROGEN FOR SCAMP EQUIPMENT.

(4464) TITLE - COMPUTER/GROUP TECHNOLOGY FOR SMALL CAL AMMO 269

PROBLEM - PRESENTLY THERE IS NO METHOD TO OPTIMIZE DESIGN OF TOOLING AND TO SELECT PROPER EQUIPMENT FOR SMALL CALIBER AMMO.

SOLUTION - INVESTIGATE POSSIBLE USE OF COMPUTER FOR OPTIMUM TOOL AND EQUIPMENT DESIGN, AND TO PREDICT PROCESS PARAMETERS AND COSTS.

(4539) TITLE - AUTOMATIC CARTRIDGE CASE HARDNESS MEASUREMENT 310 540

PROBLEM - MANUAL MEASUREMENTS BY SAMPLING METHODS ARE INADEQUATE AND COSTLY.

SOLUTION - DIRECT EDDY CURRENT TECHNIQUE WOULD PROVIDE CONTINUOUS AND 100% INSPECTION

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- 5.56MM - .30 CAL

(2743) TITLE - IMPROVED TECH FOR SMALL CALIBER AMMUNITION

PROBLEM - THE SMALL ARMS MUNITION PRODUCTION BASE MUST KEEP ABREAST OF THE RAPIDLY EMERGING NEW MANUFACTURING TECHNIQUES ON A COST/PRODUCTIVITY BASIS.

SOLUTION - CONTINUALLY MONITOR THE SMALL ARMS DEVELOPMENTS AND APPLICABLE EMERGING MANUFACTURING TECHNOLOGY.

500 1000

(4177) TITLE - NEW METH OF SM CAL TRACER CHARGE

PROBLEM - CURRENT FACILITIES AT LCAAP ARE 1942 VINTAGE CRANK TYPE CHARGING MACHINES AND ARE LABOR INTENSIVE.

SOLUTION - DEVELOP MODERNIZED TRACER CHARGING EQUIPMENT TO MEET REQUIREMENTS OF BULLET SUBMODULES AND TO IMPROVE PRODUCT UNIFORMITY AND INCREASED PERFORMANCE.

129

(4503) TITLE - NEW PROCESS FOR SWS TRACER AMMUNITION

PROBLEM - THERE IS NO U.S. CAPABILITY FOR MANUFACTURING THE PROPOSED NATO 5.56MM TRACER BULLET IN THE QUANTITIES REQUIRED FOR THE SAW SYSTEM.

SOLUTION - THE CONVENTIONAL SMALL CALIBER TRACER BULLET MANUFACTURING EQUIPMENT WILL BE MODIFIED TO PRODUCE THE NATO TRACER BULLET.

500 129

(4506) TITLE - 5.56MM CARTRIDGE LINKING SYSTEM

PROBLEM - THERE ARE CURRENTLY NO LINKING MACHINES AVAILABLE FOR LINKING PRODUCTION QUANTITIES OF 5.56MM AMMUNITION. THE MANUAL AND SEMI-MANUAL METHODS AVAILABLE ARE SLOW AND COSTLY.

SOLUTION - LINKING MACHINES FOR 7.62MM AMMUNITION DO EXIST. A MODIFICATION AND IMPROVEMENT SHOULD PROVIDE A SATISFACTORY SOLUTION. A PRODUCTION RATE OF 65.8 MILLION ROUNDS PER YEAR IS REQUIRED.

558 577

(4534) TITLE - MODERNIZED PROCESSES FOR MANUFACTURE OF NATO 5.56MM AMMO

PROBLEM - AN AMERICANIZED VERSION OF BELGIUM SS-109 WILL BE USED IN THE SAW SYSTEM. THIS EFFORT IS DIRECTED TOWARD DEVELOPMENT OF CONVENTIONAL PROCESSES TO MASS PRODUCE SWS AMMUNITION ON SCAMP EQUIPMENT.

SOLUTION - THIS PROJECT WILL DEFINE PROCESSES AND EQUIPMENT/TOOLING CHANGES REQUIRED ON SCAMP LANE. INITIATION OF THESE EFFORTS THIS YEAR WILL PROVIDE PROCESS EQUIPMENT SPECIFICATIONS FOR IMPLEMENTATION IN SUFFICIENT TIME TO MEET FY87 AND ON REQUIREMENTS.

264 812 1776

COMPONENT -- 5.56MM - .3D CAL

(CONTINUED)

(4538) TITLE - 5.56MM S&WS LINK ORIENTOR AND FEED SYSTEM

398

PROBLEM - THE M27 LINKS ARE MANUALLY ORIENTED AND PACKED AT THE LINK MANUFACTURERS. AT THE LOADING PLANT, LINKS MUST BE MANUALLY UNPACKED AND FED INTO THE LINKING MACHINES, WHICH IS TIME CONSUMING AND COSTLY.

SOLUTION - BY DEVELOPING RANDOM ORIENTOR EQUIPMENT, THE LINK MANUFACTURERS WILL BE ABLE TO SHIP LINKS IN BULK TO THE LOADING PLANT; THUS, ELIMINATING MANUAL PACKING, UNPACKING, AND COST OF CARTONS.

(4541) TITLE - AUTO PRIMER INSERT LACQUER AND ANVIL PRESENCE INSPECT SYS

616

PROBLEM - LACQUER INSPECTION AT GAGE ? WEIGH IS BEING ELIMINATED. THE PRIMER INSERT SUBMODULE CURRENTLY INSPECTS FOR PRIMER ANVIL WITH A PROBE. TO IMPROVE EFFICIENCY, A BACK-UP INSPECTION IS DESIRED CAPABLE OF BEING INSTALLED ON EXISTING EQUIPMENT.

SOLUTION - A FLUORESCENT DYE WILL BE ADDED TO THE PRIMER LACQUER TO BE DETECTED BY TWO DETECTORS. THE BACK-UP INSPECTION OF PRIMER ANVIL WILL BE EVALUATED BY USING A NONCONTACT EDDY CURRENT PROBE.

(4551) TITLE - MFG PROCESS PARAMETERS FOR XM855/856 AMMO

513

PROBLEM - THE ARMY IS DEVELOPING A PRODUCTION BASE FOR THE NATO 5.56MM AMMUNITION. HOWEVER, THERE IS NO PROCESS UNDER WHICH U.S. PRODUCED ROUNDS CAN BE PROVEN OUT FOR ACCEPTABILITY OF PERFORMANCE OR THE SUITABILITY OF THE MANUFACTURING TOOLING AND PROCESSES.

SOLUTION - PROCURE QUANTITIES OF XM855/856 AMMUNITION FROM LCAAP PRODUCED BY THE NEWLY DEVELOPED PROCESS AND TOP FOR TECHNICAL EVALUATION AND PRODUCT/TOOLING ACCEPTABILITY.

COMPONENT -- .50 CAL AND LARGER

(5021) TITLE - HOT FORMING OF P/M PROJ BODIES

170

PROBLEM - CURRENT METHODS OF FABRICATING CANNON CALIBER ROUNDS REQUIRES EXTENSIVE MACHINING TO REMOVE 60-70 PERCENT OF THE STARTING MATERIAL.

SOLUTION - FABRICATE PROJECTILE BODIES BY UTILIZING POWDER METALLURGY (P/M) HOT FORMING INTO THE DESIRED SHAPE.

(4583) TITLE - IMPROVED PROCESS FOR CAL .50 CORE MANUFACTURE

555

PROBLEM - CAL .50 BULLET CORES ARE MANUFACTURED ON SCREW MACHINES FROM STEEL ROD RESULTING IN A 33 PERCENT SCRAP RATE. THE SCRAP REPRESENTS 28 PERCENT OF EACH CORE UNIT COST.

SOLUTION - PRODUCE CORES TO NET SHAPE ON SKEWED AXIS ROLL FORMING MACHINES REDUCING SCRAP TO ABOUT 2 PERCENT OF ROD FEEDSTOCK.

FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- .50 CAL AND LARGER

(4584) TITLE - LOADING EQUIPMENT FOR CAL .50 BALL/BLANK AMMUNITION

63D 919 1D96

PROBLEM - THE INCREASED REQUIREMENTS FOR .50 CAL AMMUNITION IS IN EXCESS OF THE CAPACITIES OF CURRENT PRODUCTION EQUIPMENT.

SOLUTION - INVESTIGATE CURRENT AND PROPOSED EQUIPMENT TO DETERMINE THE MOST COST EFFECTIVE. PRODUCE A PROTOTYPE SYSTEM THAT WILL MEET THE ANTICIPATED PRODUCTION RATES.

(4585) TITLE - SABOT LAUNCHED ARMOR PENETRATOR (SLAP) AMMO MFG PROCESSES

11D 365

PROBLEM - THE MFG OF SLAP AMMUNITION REQUIRES THE DEVELOPMENT OF PROTOTYPE EQUIPMENT AND TOOLING TO PROVIDE THE MOST COST EFFECTIVE PRODUCTION.

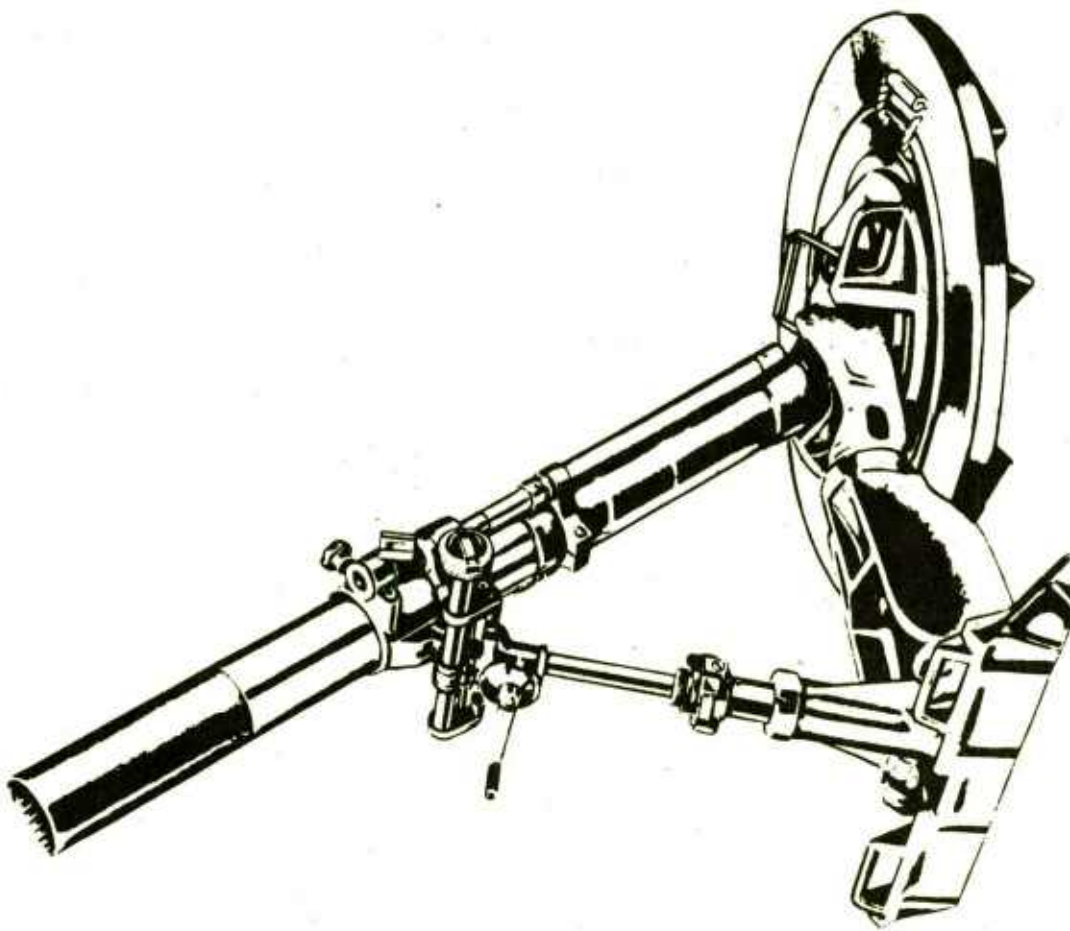
SOLUTION - PROCESSES AND EQUIPMENT WILL BE DEMONSTRATED TO COLD FORM THE AREA MULTIPLIER, TO AUTOMATE AREA MULTIPLIER FEEDING AND SABOT MOLDING, TO FABRICATE PENETRATORS FROM POWDER METAL AND TO ASSEMBLE THE SABOT/PENETRATOR/CARTRIDGE.

(4596) TITLE - PRODUCTION PROCESSES FOR CALIBER .50 PLASTIC BLANK AMMO

400 3456 620

PROBLEM - THERE IS CURRENTLY NO PRODUCTION EQUIPMENT TO PRODUCE THE PLASTIC CASED CAL .50 BLANK ROUND IN LARGE QUANTITIES. THIS IS A NEW CONFIGURATION REQUIRING NEW PRIMING AND LAP TECHNIQUES.

SOLUTION - THE PRODUCTION REQUIREMENTS WILL BE MET EITHER BY MODIFYING A SCAMP MGD B LOADING MACHINE OR A COMMERCIAL SHOT SHELL PRIMING AND LOADING MACHINE. EITHER OPTION IS SUFFICIENT TO MEET REQUIREMENTS.



**ARMAMENT R&D COMMAND**  
**ARMAMENT MATERIEL READINESS COMMAND**  
**(ARRADCOM, ARRCOM)**  
**(WEAPONS)**

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Small Caliber -----	96



## WEAPONS PROGRAM

The US Army Armament Materiel Readiness Command (ARRCOM), headquartered at Rock Island, IL, has responsibility for MMT projects on weapons in full scale production. ARRADCOM is responsible for MMT projects for weapons in development or initial production. Most of the weapons projects are performed through Watervliet Arsenal (WVA) and Rock Island Arsenal (RIA). The main emphasis of the weapons MMT program is the modernization and upgrading of operations through the REARM program. The purpose is to reduce costs and improve product quality by taking advantage of the advances in metalworking technology.

Many of the projects planned for FY82-86 at Watervliet Arsenal are related, in whole or in part, to the handling and fixturing of cannon tubes and their components. Since many items produced at Watervliet are large, complex and/or require close tolerances, the setup and movement time are important cost drivers.

A major cost driver at WVA is metal removal. Since the alloys used in weapons are expensive and difficult to work, producing components close to final shape will reduce the cost and time required for finishing. Methods being explored include hot isostatic pressing (HIP) and powder metallurgy (PM). Projects are also proposed to improve the metal removal process. High speed metal removal is addressed in several projects as are efforts proposed to perform multiple operations at one time. Some of the other areas in the Watervliet submission include group technology, computer-aided manufacturing, non-traditional surface hardening methods, chromium plating, and finding substitutes for critical materials.

Cost reductions and productivity increases in manufacturing continue to be the prime objectives of MMT at Rock Island Arsenal. Because RIA is a job-shop organization, administration and planning overhead is a significant cost driver. By developing an integrated computer-aided manufacturing/managment information system the Arsenal will be able to efficiently control all operations from receipt of an order to delivery of the product. Some of the management areas addressed include process modeling, performance measurement, computer-aided work measurement system, and online production information system. Cost benefits are also expected from improved material handling and in-process control projects which are tied into the overall CAM/MIS effort at RIA. Efforts in this area include robot loading of machines, and automated process control.

Since RIA's task is primarily metalworking, there are several projects included in this area. While all efforts will in themselves reduce costs, coupling with the Arsenal's overall CAM/MIS will further increase the benefits. Some of the areas covered include casting, welding, and electro-chemical grinding.

ARRCDM  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY	FY82	FY83	FY84	FY85	FY86
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FIRE CONTROL	1899	421	1379	2681	2111
GENERAL MANUFACTURING	2088	3211	4292	8515	4654
LARGE CALIBER	4691	2103	3723	4526	4306
QUALITY CONTROL/TESTING	383	359	1448	826	300
SMALL CALIBER	913	1181	1424	3407	4350
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TOTAL	9974	7275	12266	19955	15721

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 \* C A T E G O R Y \*  
 \*-----\*  
 \*FIRE CONTROL\*  
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MMT FIVE YEAR PLAN  
 RCS DRCMT 126

FUNDING (\$DDD)

PRIOR	82	83	84	85	86
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				35Q	47D

COMPONENT -- ASSEMBLIES

(8321) TITLE - ADHESIVE BONDING FC SYSTEMS

PROBLEM - CURRENT ASSEMBLY METHODS DO NOT TAKE FULL ADVANTAGE OF THE MANY ADVANCED ADHESIVE SYSTEMS AVAILABLE. MANY OPERATIONS COULD BE CONVERTED WITH SIGNIFICANT SAVINGS IN BOTH TIME AND MONEY AND WITH INCREASED RELIABILITY.

SOLUTION - SELECT A SERIES OF ASSEMBLY OPERATIONS AS CANDIDATES FOR ADHESIVE BONDING. DESIGN BONDING SYSTEMS, APPLY, TEST AND EVALUATE. PREPARE PROCESS SPECIFICATIONS FOR THE SUCCESSFUL SYSTEMS.

COMPONENT -- GENERAL

(7966) TITLE - MANUFACTURE OF TRITIUM POWERED RADIO LUMINOUS LAMPS

PROBLEM - CURRENT METHODS OF CONTROLLING MOISTURE CONTENT, SEALING AND ALUMINIZING TRITIUM LAMPS ARE BELIEVED RESPONSIBLE FOR THE PRESENT LACK OF DEPENDABILITY.

SOLUTION - DETERMINE THE PRODUCTION CONDITION THAT WILL RESULT IN OPTIMUM HALF-BRIGHT LIFE AND MODIFY CURRENT PRODUCTION METHODS ACCORDINGLY.

(8263) TITLE - PROD. IN-PROCESS INSPECT EQUIP FOR LASER RANGE FINDER (CAM)

PROBLEM - CURRENT PRODUCTION/IN-PROCESS INSP. TECHNIQUES ARE REJECTING GOOD LASER RANGE FINDERS. THE REJECTION OF GOOD LRF IS ATTRIBUTED TO INACCURACIES OF RADIMETERS AND INCANDESCENT LIGHT SOURCES USED TO MEASURE THE LASER POWER OUTPUT AND SENSITIVITY.

SOLUTION - ADVANCES IN ELECTRO-OPTICAL TECHNOLOGY, DIGITAL RADIMETERS AND CALIBRATED SOLID STATE LIGHT SOURCES WILL BE USED TO CORRECT CURRENT INSP. INACCURACIES.

(8327) TITLE - COMPUTER INTEGRATED MFG (CIM F/FC MATERIAL) (CAM)

PROBLEM - MANUFACTURING METHODOLOGIES AND THE APPLICATION OF CAD AND CAM TO FC MANUFACTURING HAS ONLY PRODUCED ISOLATED IMPROVEMENTS AND MANY OF THE MAJOR PRODUCTION PROBLEMS STILL PREVAIL.

SOLUTION - A SYSTEMS APPROACH WITH COMPUTER INTEGRATED MANUFACTURING METHODOLOGIES TO ESTABLISH A CLOSE-LOOP SYSTEM FOR THE DESIGN-THROUGH MANUFACTURING PROCESS FOR FC, INCLUDING PLANNING ENGINEERING, QA, AND DECISION MAKING.

COMPONENT -- OPTICS

(8080) TITLE - HIGH SPEED FABRICATION OF ASPHERIC OPTICAL SURFACES

PROBLEM - THE BULK OF THE COST OF OPTICS FOR FIRE CONTROL SYSTEMS LIES IN THE FIGURING AND POLISHING STAGE.

SOLUTION - USE THE TUBULAR TOOL GRINDING PROCESS TO PRODUCE ASPHERIC SURFACES DIRECTLY DURING THE GRINDING PROCESS

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- OPTICS

(CONTINUED)

(8108) TITLE - THERMOGRAPHIC EVALUATION OF OPTIC BANDS

283

PROBLEM - THE BOND BETWEEN OPTICAL ELEMENTS AND THEIR STRUCTURAL SUPPORTS MUST BE FREE OF VOIDS, OF UNIFORM THICKNESS AND OF SUFFICIENT STRENGTH TO HOLD FAST AND MAINTAIN ALIGNMENT UNDER SEVERE SHOCK.

SOLUTION - INTRODUCE THERMOGRAPHIC PROCEDURES TO THE INSPECTION OF OPTICAL BONDS.

(8165) TITLE - STANDARDS FOR DIAMOND TURNED OPTICAL PARTS

189 258

PROBLEM - EXISTING SURFACE FINISH STANDARDS AND TESTING EQUIPMENT AND TECHNIQUES DO NOT COVER THE RANGE OF DIAMOND TURNED OPTICAL SURFACES FOR A PRODUCTION ENVIRONMENT (1/2 TO 1 MICRONS).

SOLUTION - CORRELATE LASER SCATTEROMETRY AND INTERFERENCE CONTRAST MICROSCOPY WITH FUNCTIONAL OPTICAL TESTING TO OPTIMIZE THE SPECIFICATION OF THE SURFACE WITH A MEASUREMENT TECHNIQUE FOR A PRODUCTION ENVIRONMENT.

(8209) TITLE - PILOT PRODUCTION OF GRADIENT INDEX OPTICS

487 100

PROBLEM - GRADIENT OPTICS, WHERE IN THE INDEX OF THE GLASS IS SEQUENTIALLY VARIED TO OBTAIN DESIGNED OPTICAL CHARACTERISTICS IS FAR MORE DESIRABLE THAN CURRENT USED, I.E., FORMING A CURVE ON THE GLASS SURFACE.

SOLUTION - ESTABLISH, SUBSEQUENT TO THE INTRODUCTION AND DEVELOPMENT OF GRADIENT OPTICS TO MILITARY USE, A PILOT PRODUCTION FACILITY TO MANUFACTURE GRADIENT OPTICS AT A REQUIRED RATE.

(8211) TITLE - NET SHAPE OPTICAL PROCESSING

400 500

PROBLEM - CONSIDERABLE TIME AND EFFORT IS REQUIRED TO PROCESS AN OPTIC FROM A RAW PRESSING TO ITS FINAL SHAPE.

SOLUTION - IMPROVE OPTICAL PRESSING TECHNIQUE TO ACHIEVE NEAR NET SHAPES IN THE INPUT BLANK.

(8262) TITLE - PRODUCTION METHODS FOR OPTICAL WAVE GUIDES

480 421

PROBLEM - MANUFACTURE OF INTEGRATED WAVEGUIDES IS COMPLICATED AND TIME CONSUMING INVOLVING PROCESSES RELATED TO METHODS USED TO MAKE SEMICONDUCTOR INTEGRATED CIRCUITS.

SOLUTION - USE ION IMPLANTATION TO ALTER OPTICAL PROPERTIES OF GALLIUM ARSENIDE AND PHOSPHIDE SUBSTRATES TO DIRECTLY FORM OPTICAL WAVEGUIDES IN A ONE-STEP PROCESS.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- OPTICS

(CONTINUED)

(8329) TITLE - FIRE CONTROL OPTICAL DEVICES NEW PROCESS PRODUCTION TECH

PROBLEM - PRODUCTION DELAYS AND COST OF REMOVALS HAVE BEEN A GREAT LOGISTICS PROBLEM. THERE HAS BEEN A SIGNIFICANT SHORTFALL IN PRODUCTION CAPABILITY.

SOLUTION - ASSESSMENT OF NEW PROCESS TECHNOLOGY, UPDATED EQUIPMENT AND OPTIMIZED PROCESSES IS NECESSARY FOR THE ASSEMBLY OF A PILOT PRODUCTION LINE CAPABLE OF DEMONSTRATING HIGH SPEED PRODUCTION AND IMPROVED INSPECTION TECHNIQUES.

460 630

(8467) TITLE - DIAMOND POINT TURNING OF GLASS OPTICS

PROBLEM - THE GENERATION OF UNCONVENTIONAL AND EXTREMELY ASPHERICAL-OPTIC SURFACES HAVE BEEN DIFFICULT AND EXPENSIVE TO MAKE BY CONVENTIONAL TECHNIQUES. RECENT DEVELOPMENTS HAVE ESTABLISHED A BASIS FOR DIAMOND TURNING OF GLASS OPTICS.

SOLUTION - INVESTIGATE AND APPLY N/C PRECISION MACHINING AND POSITIONAL MEASUREMENT FEEDBACK SYSTEMS FOR DIAMOND TURNING SMOOTH DAMAGE FREE GLASS SURFACES AND APPLY THE ADVANCES IN THE METROLOGY FOR THESE SURFACES.

450 380

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\* C A T E G O R Y \*  
\*-----\*  
\*GENERAL MANUFACTURING \*  
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COMPONENT -- EQUIPMENT

(8154) TITLE - COMPUTER INTEGRATION MFG (CIM), DDNC

PROBLEM - NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.

SOLUTION - INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE DNC TECHNOLOGY.

442 650 450

(8424) TITLE - AUTOMATIC/ROBOTIC WELDING OF WEAPON COMPONENTS (CAM)

PROBLEM - THE REPAIR OF DEFECTIVE WELDS ARE FREQUENTLY EXPERIENCED. REPAIR REQUIREMENTS ARE OFTEN TRACED TO THE SKILL LEVEL OF THE WELDING OPERATORS.

SOLUTION - ADAPTIVE CONTROLS ARE BEING USED IN AN INCREASING NUMBER OF WELDING APPLICATIONS TO EMPHASIZE OPERATOR'S SKILL IN MAKING CONSISTENT PRODUCT. SUCH FEEDBACK CONTROL ROBOTS SHOULD BE USED ALSO IN WEAPONS FABRICATION.

291 438

PRIOR 82 83 84 85 86

COMPONENT -- EQUIPMENT

(CONTINUED)

(8532) TITLE - ARMCAM FOR FUTURE CAM ACTIVITIES

PROBLEM - IN CONDUCTING SEPARATE EFFORTS ON CAM, IT CAN BE EXPECTED THAT PURCHASED EQUIPMENT MAY NOT BE FULLY UTILIZED OR SOFTWARE MAY NOT BE COMPATIBLE WITHIN VARIOUS CAM SYSTEMS USED BY DIFFERENT ARMY INSTALLATIONS AND SUPPLIERS.

SOLUTION - DEVELOP A MASTER PLAN FOR ARMY CAM ACTIVITIES. IT WILL OUTLINE MEDIUM TO LONG-RANGE GOALS FOR FURTHER CAM APPLICATION AND DETERMINE WHAT MFG AREAS REQUIRE MORE EMPHASIS.

(8608) TITLE - STATE-OF-THE-ART LADLE/FURNACE REFINING

PROBLEM - THERE ARE NO PROVISIONS IN PROJECT 683B251, IMPROVED MELTING PRACTICES, TO IMPLEMENT TECHNIQUES THAT REQUIRE PURCHASE OF MAJOR ITEMS SUCH AS AN ARGON OXYGEN DECARBURIZATION FURNACE.

SOLUTION - THIS PROJECT WILL BE USED TO INSTALL NEW FURNACE/LADLE EQUIPMENT. THE BEST PROCESS PARAMETERS WILL BE DETERMINED AND CONTROLS WILL BE EVALUATED.

COMPONENT -- INFORMATION SYSTEMS

(8132) TITLE - PERFORMANCE MEASUREMENT PARAMETERS FOR GOGU MFG.

PROBLEM - MEASURING THE PERFORMANCE OF A GOVERNMENT MANUFACTURING OPERATION IS DIFFICULT. GOGU OPERATIONS, ALTHOUGH PARTIALLY COMPETITIVE, ARE NOT IN A FULLY COMPETITIVE MARKETPLACE. ACCOUNTING DATA BY ITSELF IS NOT SUFFICIENT TO MEASURE PERFORMANCE.

SOLUTION - DEVELOP A SERIES OF MEASUREMENTS THAT COMBINE ACCOUNTING DATA AND PRODUCTION DATA TO ADEQUATELY ASSESS PERFORMANCE. INCLUDE DATA ON TECHNOLOGICAL IMPROVEMENTS, INFLATION, PRODUCT COST, ETC. MEASUREMENTS WILL BE USEFUL IN LONG RANGE PLANNING.

(8305) TITLE - INTEGRATED MANUFACTURING SYSTEM(ICAM)

PROBLEM - MIS'S ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MANUFACTURING ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILITY, LABOR AND MATERIALS.

SOLUTION - DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO DELINEATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.



FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- INFORMATION SYSTEMS (CONTINUED)

(8306) TITLE -- ON-LINE PRODUCTION INFORMATION SYSTEM (CAM)

PROBLEM -- THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM, MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING, TIME STUDS GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.

SOLUTION -- DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.

70 360 401

COMPONENT -- MISCELLANEOUS

(8030) TITLE -- MANUFACTURING GUIDE FOR ELASTOMERIC SEALS

PROBLEM -- CONSTANT PROBLEMS IN THE PROCUREMENT OF SATISFACTORY SEALS FOR WEAPONS SYSTEMS, I.E., M14D, M127, ETC., ARE EXPERIENCED WITH RESULTANT SOLE SOURCE PURCHASES.

SOLUTION -- ELIMINATE SOLE SOURCE PROCUREMENT BY DOCUMENTING PROCESSING TECHNIQUES AND FORMULA VARIATIONS FOR A VARIETY OF MILITARY SEALS FOR PUBLICATION IN A GUIDE FOR USE BY INDUSTRY.

123 112

(8252) TITLE -- INDUCTION HEATING OF VARYING DIAMETER PREFORMS

PROBLEM -- TO FORGE A PREFORM REQUIRES HEATING IN THE INDUCTION SYSTEM. THE PRESENT SYS HAS 4 LINES WHICH OSCILLATE THE PREFORM THRU THE INDUCTION COIL CONTROLLED BY A NONVARYING POWER SUPPLY WHICH PRECLUDES PRECISE HEATING OF A VARYING DIAMETER PREFORM.

SOLUTION -- DESIGN A DEVICE THAT WILL AUTOMATICALLY ADJUST THE POWER TO THE COILS, BASED ON PREFORM DIAMETER. IT WOULD SENSE PREFORM DIAMETER AS IT ENTERS THE COIL AND ADJUST POWER ACCORDINGLY.

241

(8464) TITLE -- PROCESSES FOR PLASTIC/COMPOSITE FC COMPONENTS/INSTRUMENTS

PROBLEM -- LACK OF OPTICAL PERFORMANCE, THERMAL STABILITY, ENVIRONMENTAL RESISTANCE HAS PREVENTED USE OF THESE MATERIALS FOR ARMY APPLICATION. USE OF PLASTICS FOR FIRE CONTROL OPTICAL SYSTEMS OFFERS SIGNIFICANT POTENTIAL FOR COST AND WEIGHT REDUCTIONS.

SOLUTION -- THIS PROJECT WILL IDENTIFY THE MFG PROCEDURES AND CONTROLS AND THE PLASTIC MATERIALS WHICH MUST BE MODIFIED TO UPGRADE THE MANUFACTURED ITEM TO MILITARY QUALITY. A PILOT PRODUCTION LINE WILL BE ESTABLISHED.

250 750

(CONTINUED)

COMPONENT -- MISCELLANEOUS

(8535) TITLE - DETERMINATION OF AREAS WITHIN MANTECH FOR FUTURE R'D

95 105

PROBLEM - WITH THE ADVENT OF THE NEW ARMY BATTLE PLAN, FIELD CAPABILITY FOR MANUFACTURING REPLACEMENT PARTS AND REPAIRS WILL BE NEEDED. THE ECONOMICS, FUTURE DEVELOPMENTS, SIGNIFICANT PROCESSES AND COMPONENTS REQUIRING NEW TECHNIQUES NEED IDENTIFICATION.

SOLUTION - BY COMPILING INFO ON MFG OF MILITARY HARDWARE FROM DOMESTIC AND FOREIGN SOURCES, DETERMINE THOSE ITEMS WHICH ARE DIFFICULT/EXPENSIVE TO MFG AND SUGGEST POSSIBLE PRODUCTION TECHNIQUES FOR CONUS OR BATTLEFIELD USES.

COMPONENT -- PROCESSES

(7707) TITLE - AUTOMATED PROCESS CONTROL FOR MACHINING (CAM)

105 135

PROBLEM - MACHINING OPERATIONS ARE SELECTED, PARAMETERS ARE SET, AND STANDARDS ARE ESTABLISHED EMPIRICALLY WITH LITTLE OR NO ENGINEERING ANALYSES, CONTROL OR FEEDBACK.

SOLUTION - APPLY COMPUTERIZED CONTROLS FOR OVERALL SELECTION OF PROCESSES, OPERATIONS, PARAMETERS, FEEDBACK AND OPTIMIZATION, WITH AUTOMATED ESTIMATING AND DETERMINATION OF REAL TIME AND COSTS.

(7940) TITLE - SYNERGISTIC PLATINGS WITH INFUSED LUBRICANTS

121 175

PROBLEM - LOW FRICTION, WEAR RESISTANT SURFACES ARE NEEDED FOR COMPONENTS IN SLIDING CONTACT.

SOLUTION - USE OF TWO-SYSTEM COATINGS INCORPORATING SOLID LUBRICANT INTERLOCKED WITH METAL PLATING.

(8006) TITLE - ESTABLISHMENT OF ALLOY PLATING PROCESS

165 180

PROBLEM - SEVERAL COATING MATERIALS SUCH AS CHROMIUM ARE IN SHORT SUPPLY.

SOLUTION - REPLACE OR REDUCE THE AMOUNT OF CRITICAL ELEMENTS IN THE COATING BY ALLOY PLATING.

(8113) TITLE - ESTABLISHMENT OF ION PLATING PROCESS FOR ARMAMENT PARTS

150 142

PROBLEM - OOD IS REPLACING TOXIC CADMIUM WHEREVER POSSIBLE. CURRENTLY, CADMIUM PLATING IS SPECIFIED FOR APPROXIMATELY 3000 ARMAMENT COMPONENTS. EQUALLY IMPORTANT IS THE ELIMINATION OF THE HYDROGEN EMBRITTLEMENT OF STEEL CAUSED BY ALL ELECTROPLATING PROCESSES.

SOLUTION - ION PLATING ALUMINUM COATINGS TO STEEL ARMAMENT SUBSTRATES WILL PROVIDE CORROSION RESISTANCE SUPERIOR TO THAT OF ZINC OR CADMIUM PLATING. ION PLATING AND ELECTROPLATING COSTS ARE SIMILAR. PROCESS NEEDS TO BE ESTABLISHED FOR ARMAMENT ITEMS.

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT -- PROCESSES

(CONTINUED)

(8120) TITLE - ADAPTIVE CONTROL TECHNOLOGY (CAM)

PROBLEM - CURRENT GRINDING PROCESSES DO NOT TAKE ADVANTAGE OF THE GRINDING WHEEL CUTTING EFFICIENCY. PRECISION TOLERANCES ARE DIFFICULT TO HOLD DUE TO PART HEATING. WHEEL WEAR RATES INCREASE EXPONENTIALLY WITH FEED RATES AND LIMIT PRODUCTIVITY.

SOLUTION - USE A PROCESS CALLED ENERGY GRINDING. IT USES AN ADAPTIVE CONTROL, FITTED TO A CYLINDRICAL GRINDER. WHEEL SPEED, WHICH DETERMINES WHEEL SHARPNESS WHICH EFFECTS METAL REMOVAL RATES AND EFFICIENCY, IS CONTROLLED.

(8135) TITLE - INPROCESS CONTROL OF MACHINING

PROBLEM - DURING MFG. OF RECOIL CONTROL ORIFICES, ERRORS ARE INTRODUCED WHICH REQUIRE REMARK. CORRECTIVE ACTIONS INVOLVE COSTLY DETAILED INSPECTION AND REANALYSIS WITH COMPUTERIZED DESIGN PROGRAMS TO DEFINE POSSIBLE REMARK ALTERNATIVES.

SOLUTION - AN IMPROVED MANUFACTURING METHOD UTILIZING ADAPTIVE CONTROLS AND AUTOMATED INSPECTION EQUIPMENT WILL BE ESTABLISHED. MACHINE TOOLS WILL BE RETROFITTED.

(8206) TITLE - APPLICATION OF HIGH-RATE ABRASIVE MACHINING

PROBLEM - CONVENTIONAL GRINDING IS SLOW AND COSTLY. LONG, MULTIPLE PASSES AND INFEDS ARE REQUIRED TO SIZE AND FINISH WEAPON COMPONENTS.

SOLUTION - APPLY HIGH-SPEED ABRASIVE-BELT MACHINING.

(8225) TITLE - ELECTROCHEMICAL GRINDING OF WEAPON COMPONENTS

PROBLEM - SIZING AND FINISHING OF LARGE, LONG WEAPON COMPONENTS BY CONVENTIONAL GRINDING IS SLOW AND COSTLY, OFTEN REQUIRING MULTIPLE OPERATIONS, SET UPS, WHEEL CHANGES, AND REPETITIVE MULTIPLE PASSES. FOR EXAMPLE- PLANNING / GRINDING HOWITZER MOUNT RAIL.

SOLUTION - RETROFIT EXISTING, SPECIAL LONG BED, HORIZONTAL, SURFACE GRINDER WITH ELECTROLYTIC SYSTEM TO PROVIDE FAST, SINGLE PASS ROUGH FINISHING OF LARGE COMPONENTS, ELIMINATE ROUGHING BY PLANNING OR MILLING BEFORE ELECTROLYTIC GRINDING.

(8231) TITLE - IMPROVED CASTING TECHNOLOGY (CAM)

PROBLEM - EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.

SOLUTION - USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND GATING AND RISER CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.

60

495

60

613

566

100

200

130

250

250

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT -- PROCESSES

(CONTINUED)

(8254) TITLE - AUTOMATED SURFACE COATING OF CANNON (CAM)

8D

PROBLEM - IT REQUIRES APPROXIMATELY 2 1/2 HOURS PER TUBE TO APPLY ONE UNDER COAT AND TWO FINISH COATS OF PAINT BY MANUAL BRUSHING. CURRENT DRYING METHODS REQUIRE EXCESSIVE FLOOR SPACE AND OVERHEAD CRANE SUPPORT.

SOLUTION - DESIGN AN AUTOMATED SURFACE COATING SYSTEM THAT CONSISTS OF ELECTRONICALLY CONTROLLED, HYDRAULICALLY POWERED ELECTRO-STATIC SPRAYING MACHINES, INTEGRATED MATERIAL HANDLING, AND AUTOMATIC DRYING SYSTEMS, ALL UNDER COMPUTER CONTROL.

(836D) TITLE - ESTABLISHMENT OF ZINC ION VAPOR DEPOSITION PROCESS

235

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(84D2) TITLE - WARM FORGING OF WEAPON COMPONENTS (CAM)

227 227

PROBLEM - EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.

SOLUTION - BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES

(84D3) TITLE - DESIGN CRITERIA FOR HARDENING (CAM)

261 278

PROBLEM - SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELDMENTS ARE RECURRING PROBLEMS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.

SOLUTION - THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAPE, AND COMPOSITION WILL BE ESTABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION

(8503) TITLE - ELECTRO-MECHANICAL JOINING TECHNIQUES

220 100

PROBLEM - PURELY MECHANICAL (FRICTION WELDING) OR MOSTLY ELECTRICAL (RESISTANCE) WELDING MACHINES OF VARIOUS TYPES WOULD HAVE TO BE LARGE AND WOULD TAKE EXCESSIVE TIME TO WELD JOINT AREAS 25 SQUARE INCHES OR MORE.

SOLUTION - COMBINE THE FEATURES OF BOTH METHODS TO DELIVER SUFFICIENTLY LARGE SPECIFIC ENERGY FOR WELDING OF LARGE PARTS.

COMPONENT — PROCESSES

(CONTINUED)

(8513) TITLE — MICROWAVE CURING OF FURAN BONDED SAND

140

PROBLEM — CURE RATE OF FURAN BOND SANDS DEPENDS ON THE ACID CATALYST/RESIN RATIO AND THE SIZE AND TEMP OF THE MOLD. SINCE PDN RATES ARE HIGH, SOME RATIOS CANNOT BE USED WHILE USEABLE RATIOS ARE A COMPROMISE BETWEEN VALUES FOR LARGE AND SMALL MOLDS.

SOLUTION — USE MICROWAVE HEATING TO CHANGE THE CURE CHARACTERISTICS OF SELECTED RESIN-CATALYST SYSTEMS TO COMPENSATE FOR DIFFERENT SIZES OF MOLDS. THIS WILL PERMIT A MORE UNIFORM PRODUCTION RATE.

(8514) TITLE — OPTIMIZATION OF MACHINING PARAMETERS

200 150

PROBLEM — CONTROL OF TIME, COST AND QUALITY DEPENDS ON EMPIRICAL ADJUSTMENTS TO THE PDN EQUIPMENT. APPLICATION OF FULLY AUTOMATED CONTROLS HAS BEEN DELAYED BY NONAVAILABILITY OF STATE-OF-THE-ART EQUIPMENT.

SOLUTION — APPLY AVAILABLE COMPUTERS TO ANALYZE AND QUANTIFY THE EFFECTS OF BASIC OPERATION VARIABLES ON THE COST AND QUALITY OF THE WORKPIECE. DEVELOP SOFTWARE TO DETERMINE THE OPTIMUM OPERATION VARIABLES TO BE INCLUDED ON THE SHOP ORDER.

(8515) TITLE — APPLICATION OF WIDE AREA PLUNGE GRINDING

200

PROBLEM — CONVENTIONAL MACHINING OF WORKPIECES WITH MULTIPLE DIAMETERS AND BLEND TAPERS AND RADIi REQUIRES MANY OPERATIONS AND IS SLOW AND COSTLY.

SOLUTION — USE A WIDE GRINDING WHEEL WHOSE FACE IS DRESSED TO THE REQUIRED PROFILE AND PRODUCE THE FINISHED PIECE IN ONE OPERATION BY PLUNGE GRINDING TO SIZE.

(8522) TITLE — LASER SURFACE ALLOWING PROCESS FOR IMPROVED WEAR RESISTANCE

300 350

PROBLEM — NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION — NO SOLUTION PROVIDED BY ARRADCOM.

(8523) TITLE — ION IMPLANTATION OF WEAPON COMPONENTS

375

PROBLEM — NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION — NO SOLUTION PROVIDED BY ARRADCOM.

(8534) TITLE — CONSERVATION OF ENERGY IN PROCESSING OF WEAPONS COMPONENTS

350 280

PROBLEM — PRESENT HEAT TREAT TECHNIQUE AND SELECTION OF HEAT TREAT EQUIPMENT RELIES ON PAST EXPERIENCE AND IS NOT BASED ON SCIENTIFIC CALCULATIONS.

SOLUTION — EVAL PRESENT TECHNIQUES AND EQUIPMENT. DEVELOP COMPUTER-AIDED-MODULAR METHOD TO PREDICT MIN TIME REQD TO HEAT A PART. DEVELOP MODELS TO COMPARE COSTS TO HEAT A GIVEN PART BY VARIOUS MEANS (GAS, INDUCTION, RESISTANCE, ETC).

(CONTINUED)

COMPONENT -- PROCESSES

(8602) TITLE - LASER SURFACE HARDENING

125

PROBLEM - CURRENTLY AT RIA THE ENTIRE COMPONENT IS HEAT TREATED. THIS CAN CAUSE DISTORTION AND DISTURBED SURFACES, AND CAN ELIMINATE THE BENEFITS OF SELF QUENCHING AND CONTROLLED PENETRATION.

SOLUTION - LASER HEAT TREATING PERMITS THE TREATMENT OF SELECTED AREAS. FINE PRECISION AND RAPID PRODUCTION CAN BE OBTAINED WITHOUT DISTORTION OR SURFACE SCALE.

(8603) TITLE - ROBOTIC WELDING

250

(8605) TITLE - RING ROLLING OF WEAPON COMPONENTS

190

PROBLEM - COMPONENTS WITH RING LIKE SHAPE OFTEN REQUIRE EXTENSIVE METAL REMOVAL OVER ALMOST THE ENTIRE SURFACE BECAUSE TUBING OF THE OPTIMUM SIZE FOR RAW MATERIAL IS NOT AVAILABLE. THIS INCREASES PRODUCTION COSTS.

SOLUTION - SIMPLE SHAPED RINGS WITH LITTLE EXCESS MATERIAL WILL BE SHAPED ON SPECIAL RING ROLLING EQUIPMENT TO NEAR NET SHAPE.

(8606) TITLE - IMPROVED CARBURIZING TECHNOLOGY

180

PROBLEM - CARBURIZING IS NOW DONE IN CYANIDE SALTS WITH PRESENTS SAFETY AND DISPOSAL PROBLEMS. THE PROCESS REQUIRES CLOSE ATTENTION BY THE HEAT TREATERS TO MEET QUALITY AND SAFETY REQUIREMENTS.

SOLUTION - USE A FLUIDIZED BED FURNACE WHICH CAN BE APPLIED TO CARBURIZING, ANNEALING IN NEUTRAL ATMOSPHERE, OR GENERAL HEAT TREAT IN AIR.

(8610) TITLE - PREPARATION OF COUPONS REPRESENTATIVE OF CASTINGS

200

PROBLEM - MANY SPECS REQUEST THE DESTRUCTIVE TEST OF A SEPARATELY PREPARED COUPON RATHER THAN THE ACTUAL PART. THE MECHANICAL PROPERTIES OF THE MATERIAL IN THE COUPON FREQUENTLY DIFFER FROM THOSE IN THE CASTINGS.

SOLUTION - THIS PROGRAM WILL ESTABLISH PROCEDURES FOR DESIGNING AND HEAT TREATING COUPONS THAT ACCURATELY REPRESENT ACTUAL PARTS.

(8611) TITLE - AUTOMATED ANALYSIS AND CONTROL OF PLATING BATHS

150

PROBLEM - PERIODIC WET CHEMISTRY ANALYSIS OF PLATING BATHS IS READ TO MAINTAIN PROPER CHEMICAL BALANCE. THE TIME LAG BETWEEN ANALYSIS AND USE IS A DETRIMENTAL FACTOR.

SOLUTION - APPLY AUTOMATED ANALYTICAL EQUIPMENT FOR THE CONTINUOUS MONITORING OF BATH COMPOSITIONS AND FOR THE AUTOMATIC ADDITION OF THE REQD INGREDIENTS. THIS EQUIPMENT WILL IDENTIFY IMPURITIES IN THE BATH AND ALSO CHECK WASTEWATER.



PRIOR 82 83 84 85 86

COMPONENT --- PROCESSES

(CONTINUED)

(8613) TITLE - POWDERED METALS FOR NONFERROUS COMPONENTS

120

PROBLEM - ROCK ISLAND ARSENAL MUST CAST SMALL PARTS FROM AL OR CU ALLOYS THAT ARE NOT VERY CASTABLE. SHRINKAGE, HOT TEARING AND OXIDES CAUSE UNSOUND CASTINGS WITH ATTENDANT LOW ACCEPTANCE RATES.

SOLUTION - IMPROVE ACCEPTANCE BY MAKING THE PROBLEM COMPONENTS FROM POWDERED METAL. COMPARE PROPERTIES OF PM PARTS WITH CAST PARTS. DETERMINE IF ADDITIONAL PROCESSING SUCH AS HIP IS NEEDED AND PERFORM AN ECONOMIC COMPARISON.

COMPONENT --- TOOLING

(8248) TITLE - APPLICATION OF HIGH-RATE CUTTING TOOLS

102

PROBLEM - APPLICATION OF NEW HIGH-RATE CUTTING TOOLS LAG DUE TO LACK OF TESTING, ANALYSES AND ENGINEERED APPLICATIONS. MANUFACTURERS PROVIDE INSUFFICIENT DATA FOR EFFICIENT APPLICATIONS OF CERAMICS, OXIDES, NITRIDES, BORIDES, AND DIAMONDS.

SOLUTION - HIGH-RATE CUTTING TOOLS WILL BE TESTED, ANALYSED, AND APPLIED WITH BOTH NEW AND EXISTING MACHING TOOLS. ENGINEERING GUIDELINES WILL BE ESTABLISHED FOR BOTH PHYSICAL AND ECONOMIC MACHINING PARAMETERS AND LIMITS.

(8307) TITLE - CRYOGENIC TREATMENT OF TOOL STEELS

130

PROBLEM - MANY METAL CUTTING OPERATIONS REQUIRE TOOL STEEL CUTTERS OF FORMING TOOLS RATHER THAN CARBIDE OR CERAMIC MATERIALS. TOOL STEEL MATERIALS DO NOT HAVE AS LONG A USEFUL LIFE AS DO THE HARDER MATERIALS AND REQUIRE FREQUENT RESHARPENING.

SOLUTION - CRYOGENIC TREATMENT OF TOOL STEELS GREATLY IMPROVES THE WEAR CHARACTERISTICS OF THE TOOL AND GREATLY REDUCES THE FREQUENCY OF RESHARPENING.

(8400) TITLE - SPECIAL TOOLING FOR FLEXIBLE MANUFACTURING

139 178

PROBLEM - CONVENTIONAL, N/C, AND FLEXIBLE MANUFACTURING SYSTEMS USE SEPARATE TOOLING WHICH LACKS COMPLETE FLEXIBILITY FOR MULTIPLE-TOOL AND/OR MULTIPLE-SPINDLE CUTTING WITH INTERCHANGEABILITY.

SOLUTION - CLASSIFY TOOLING BY GROUPS, ESTABLISH INTERCHANGEABILITY, APPLY SPECIAL MULTIPLE TOOL AND/OR MULTIPLE-SPINDLE TOOLING IN FLEXIBLE MANUFACTURING OPERATIONS AND SYSTEMS.

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\* C A T E G O R Y \*  
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\*LARGE CALIBER \*  
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FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT — BREECH MECHANISMS

(7730) TITLE — MANUFACTURE OF SPLIT RING BREECH SEALS

PROBLEM — SPLIT RINGS REQUIRE PRECISE MFG. PRESENT METHODS ARE OUTDATED AND COSTLY REQUIRING MUCH HAND FINISHING BY HIGHLY SKILLED WORKERS. REJECTION RATE HIGH WITH MUCH REWORK.

SOLUTION — AUTOMATED AND IMPROVED PROCEDURES WILL BE ADOPTED. NEW METHOD OF SLITTING RING REQUIRING LESS STOCK REMOVAL. SPECIAL EQUIPMENT WILL BE DESIGNED AND PURCHASED TO MINIMIZE HAND FINISHING BY HIGH SKILL OPERATORS.

(7926) TITLE — HOT ISOSTATIC PRESSING (HIP) OF LARGE CANNON COMP

PROBLEM — MANY HOURS ARE REQUIRED TO MACHINE THE BREECH BLOCK FURGING TO THE FINISHED PART. MORE THAN 25% OF FORGING BECOMES CHIPS. WITH HIGH COST OF ALLOY STEEL, THIS BECOMES A VERY COSTLY WASTE OF MATERIAL.

SOLUTION — HOT ISOSTATIC PRESSING (HIP) WILL FORM BREECH BLOCKS TO NEARLY FINAL SHAPE, GREATLY REDUCING MACHINING COSTS.

(8062) TITLE — RAPID INTERNAL THREADING

PROBLEM — PRODUCING INTERNAL METRIC THREADS IN BREECH RINGS IS A SERIOUS PRODUCTION PROBLEM BECAUSE OF BOTH THE TECHNIQUES AND TOOLING REQUIRED. CONVENTIONAL THREAD HOBBIING PRESENTS A PRODUCTION BOTTLENECK.

SOLUTION — CURRENT TECHNOLOGY AND RECENT TOOLING BREAKTHROUGHS HAVE EXPANDED HIGH SPEED THREADING CONSIDERABLY. AUTOMATED THREADING WILL BE AN EFFICIENT, ECONOMIC REPLACEMENT FOR THE CURRENT MILLING-TYPE THREAD HOBBIING PROCESSES.

(8102) TITLE — APPLIC. OF POWDER METALLURGY FORGINGS TO COMP.

PROBLEM — FORGINGS AND CASTINGS ARE FABRICATED OVERSIZE AND SUBSEQUENTLY MACHINED DOWN TO FINAL DIMENSIONS. FINAL COMPONENT CONFIGURATION INVOLVES A LARGE AMOUNT OF MANPOWER AND MACHINES TO REMOVE ALLOY STEEL AS CHIPS.

SOLUTION — RECENT ADVANCES HAVE OCCURRED IN POWDER METALLURGY FORGING. THE ADVANCES WILL PRODUCE 'NEAR NET SHAPE' COMPONENTS WHICH REDUCES AMOUNT OF MACHINING REQUIRED WHILE KEEPING ADEQUATE MECHANICAL PROPERTIES. UTILIZE NEW TECHNIQUE.

(8117) TITLE — SHAPED CASTING OF ESR MATERIAL

PROBLEM — COMPONENTS REQUIRE FORGING PLUS EXTENSIVE MACHINING TO ACHIEVE THE FINAL DIMENSIONS. THE FORGING PROCESS HAS ENCOUNTERED SOME PROBLEMS WITH THE MECHANICAL PROPERTIES RECURRING IN THE STEEL.

SOLUTION — A PRODUCTION PROCESS CAPABLE OF PRODUCING A SHAPED CASTING.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- BREECH MECHANISMS

(CONTINUED)

(8238) TITLE - IMPROVED BORING TOOLS FOR BREECH RING LUGS

203

PROBLEM - PRESENT METHODS OF PRODUCING THE VARIOUS HOLES ON BREECH RINGS ARE TREPPING, TWIST DRILLING, GUN DRILLING, AND FINISH BORING. PRODUCTION OF THESE HOLES IS A TIME CONSUMING AND COSTLY OPERATION.

SOLUTION - THE JOINT PROCESS OF EJECTOR DRILLING AND INDEXABLE CARBIDE INSERT HOLE DRILLING PROMISES TO REDUCE THE SEQUENCE STEPS NOW REQUIRED AND TO PROVIDE A FAR MORE MOST EFFECTIVE MEANS OF PRODUCING AN ACCEPTABLE HOLE.

(8339) TITLE - APPLIC OF NON-TRADITIONAL SURF. HARDENING METHODS

7DD 4DD

PROBLEM - PRESENT METHODS OF SURFACE HARDENING WEAPON COMPONENTS ARE COSTLY, TIME CONSUMING, AND MAY IMPART UNDESIRABLE RESIDUAL STRESSES.

SOLUTION - TO TRANSFORM THE SURFACE LAYER OF THE STEEL TO ALLOW MATERIAL TO BE UNIFORMLY QUENCHED. THE ADVANTAGES ARE LESS ENERGY USAGE, POLLUTION FREE, ALLOW HIGHER PRODUCTION RATES, AND MINIMAL POST-PROCESSING SUCH AS CLEANING AND STRAIGHTENING.

(8440) TITLE - CONTROLLED GRAIN SIZE CASTINGS, PRODUCTION AND HEAT TREAT

318 880

PROBLEM - FINE GRAIN CASTINGS HAVE DEMONSTRATED AN IMPROVEMENT IN LOW CYCLE FATIGUE LIFE BY A FACTOR OF TWO TO FOUR, IT IS EXPECTED THAT A HEAT TREATMENT WILL EXTEND THE LIFE STILL FURTHER.

SOLUTION - PROVIDE FOR CASTING A BREECH BLOCK BY ONE OF THE AVAILABLE TECHNIQUES THEN OPTIMIZE THE HEAT TREATMENT FOR THE CHOSEN ALLOY. LIFE IMPROVEMENTS WILL BE DEMONSTRATED.

COMPONENT -- GENERAL

(7724) TITLE - GROUP TECHNOLOGY OF WEAPON SYSTEMS

263 250

PROBLEM - THERE IS A NEED TO REDUCE AND CONTROL THE PROLIFERATION OF PARTS AND DESIGNS FOR ITEMS MANUFACTURED AT WATERVLIET ARSENAL.

SOLUTION - THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.

(8249) TITLE - SHORT-CYCLE HEAT TREATING OF WEAPON COMPONENTS

132 165

PROBLEM - HEAT TREATING SOAK TIMES ARE DETERMINED WITHOUT CONSIDERATION OF THE RELATIONSHIPS BETWEEN COMPOSITION, CONFIGURATION, THICKNESS, AND DETRIMENTAL EFFECTS OF AUSTENITIC GRAIN GROWTH. CONSEQUENTLY, CONSIDERABLE ENERGY IS WASTED.

SOLUTION - SUITABLE SYSTEMATIC PRODUCTION METHODS WILL BE USED TO DETERMINE THE PROPERTIES OBTAINED AT MINIMAL PROCESSING TIMES TO REDUCE ENERGY CONSUMPTION AND INCREASE PRODUCTION EFFICIENCY.

FUNDING (\$000)

PRIOR	82	83	84	85	86
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COMPONENT	GENERAL				
	(CONTINUED)				
(8323)	TITLE - SPRAY-AND-FUSE PROCESSING OF ARMAMENT COMPONENTS		215	200	
	PROBLEM - MISMATCHED AND WORN WEAPON COMPONENTS ARE NOT ONLY COSTLY TO REPLACE BUT SHORTAGE OF STRATEGIC MATERIALS IMPACT ON THE SUPPLY AND FABRICATION OF NEW COMPONENTS.				
	SOLUTION - UTILIZE THE THERMAL SPRAY AND FUSE COATING PROCESS TO SALVAGE OR RECLAIM OVERSIZED OR WORN WEAPON COMPONENTS (E.G., M14D RECOIL PISTONS).				
(8326)	TITLE - APPLICATION OF CORROSION RESISTANT GALVANIC COATINGS	185	200		
	PROBLEM - CURRENT METAL FINISHES DO NOT PROVIDE ADEQUATE CORROSION AND HEAT RESISTANCE. COMPONENTS ARE REPLACED OR REMORKED BEFORE THEIR INTENDED LIFE. FREQUENT MAINTENANCE IN THE FIELD AND DEPUTS ADD TO THE OVERALL COST OF THE COMPONENTS.				
	SOLUTION - A NEW PROCESS HAS EMERGED FOR APPLYING SUPERIOR CORROSION AND HEAT RESISTANT COATINGS. THE PROCESS, USING SERMIL-16, CONSISTS OF AN AUTOMATED SPRAY-BAKE PROCESS FOR A COATING OF ALUMINUM/CERAMIC AND INORGANIC COATINGS.				
(8426)	TITLE - APPLICATION OF LASERS TO CANNON MANUFACTURE		750		
	PROBLEM - COMPONENT MARKINGS, TOOL MAINTENANCE, COMPONENT SURFACE HARDENING, CUTOFF OF INVESTMENT CAST COMPONENTS, WELDING AND BRAZING ARE DIFFICULT, COSTLY, TIME CONSUMING MANUFACTURING OPERATIONS.				
	SOLUTION - APPLY LASER TO THESE TRADITIONAL MANUFACTURING OPERATIONS TO TAKE ADVANTAGE OF THIS RAPIDLY EMERGING TECHNOLOGY.				
(8435)	TITLE - SQUEEZE CASTING OF CANNON COMPONENTS		231	576	
	PROBLEM - PRESENT PROCESSES, SUCH AS HOT FORGING AND SAND CASTING REQUIRE CONSIDERABLE MACHING WITH ATTENDANT HIGH COSTS AND LOSS OF CRITICAL ALLOYS.				
	SOLUTION - INVESTIGATE THE APPLICATION OF SQUEEZE CASTING AS A CLOSE TO NET SHAPE TECHNOLOGY FOR MANUFACTURING BOTH MAJOR AND MINOR CANNON COMPONENTS.				
(8437)	TITLE - DENSIFICATION OF WEAPON CASTINGS (HIP)		195		
	PROBLEM - CASTINGS FOR WEAPONS COMPONENTS OFTEN CONTAIN EXCESSIVE SHRINKAGE CAVITIES AND VOIDS, RESULTING IN REJECTION OR COSTLY WELD REPAIR.				
	SOLUTION - INTERNAL VOIDS CAN BE MADE SMALLER OR ELIMINATED BY HOT ISOSTATIC PRESSING (HIP), THEREBY IMPROVING TOUGHNESS AND DUCTILITY.				

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT --- GUN MOUNTS

(0251) TITLE - IMPROVED MELTING AND POURING TECHNOLOGY

193 164

PROBLEM - THERE IS A HIGH REJECTION RATE FOR CASTING POURED AT RIA BECAUSE MODERN TECHNIQUES ARE NOT USED TO MEASURE AND CONTROL PROCESS PARAMETERS AND PURDUSITY.

SOLUTION - PROCEDURES TO MINIMIZE DISSOLVED GAS AND TO MORE ACCURATELY MEASURE GAS CONCENTRATIONS WILL BE ESTABLISHED. METHODS OF MEASURING TEMPERATURES AND COMPOSITIONS OF ATMOSPHERES IN FURNACES AT RIA WILL BE ESTABLISHED.

COMPONENT --- RECOIL MECHANISMS

(0239) TITLE - IMPROVED MACHINING PROCEDURES FOR RAILS

254

PROBLEM - CURRENTLY THE DOVETAIL CONFIGURATION ON THE RAILS IS MILLED WITH A SERIES OF HIGH SPEED STEEL FORM MILLS. THESE MILLS REQUIRE A GREAT DEAL OF SHARPENING, AND THIS CHANGES THEIR SIZE THIS COMPOUNDING THE PROBLEM OF MAINTAINING ALIGNMENT.

SOLUTION - A 60 PERCENT REDUCTION IN MANUFACTURING TIME COULD BE REALIZED USING THE LATEST CONCEPTS IN MACHINE TOOLS. THESE INCLUDE CROSS AXIAL MOVEMENTS AND A METHOD OF HIGH SPEED MILLING USING INDEXABLE CARBIDE INSERTS.

(0250) TITLE - IMPROVED FABRICATION OF RECOIL WEAR SURFACES

123 268

PROBLEM - PRESENTLY GRINDING AND HONING OPERATIONS ON WEAR SURFACES RESULT IN PARTICLE INCLUSIONS WHICH COME IN CONTACT WITH HYDRAULIC AND PRODUCE HIGH WEAR RATES.

SOLUTION - USING ADVANCED METHODS REMOVE FOREIGN PARTICLES PRIOR TO THE FINAL GRINDING OR HONING OPERATIONS OR, IF MORE EFFECTIVE, AFTER FINAL GRINDING OR HONING.

(0422) TITLE - HONE FORMING OF RECOIL CYLINDERS

250 700

PROBLEM - REPLACEMENT OF SCARRED, WORN OR MISMACHINED RECOIL CYLINDERS ARE COSTLY AND TIME-CONSUMING IN TERMS OF LONG-LEAD TIMES FOR MATERIAL DELIVERY AND MACHINING. CYLINDER REPLACEMENT REQUIRES ADDITIONAL CONSUMPTION OF STRATEGIC MATERIALS.

SOLUTION - HONE FORMING IS A SIMULTANEOUS PROCESS WHERE HONING AND MATERIAL BUILDOUT BY ELECTROPLATING TAKE PLACE TO ACHIEVE THE DESIRED DIMENSION AND FINISH. COST SAVINGS CAN BE ACHIEVED WITH THE PROCESS FOR RECOIL CYLINDER MANUFACTURE AND RECLAMATION.



FUNDING (\$DD00)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT --- RECOIL MECHANISMS

(8607) TITLE - AUTOMATED FLUSHING OF RECOIL SYSTEMS TO REDUCE CONTAMINATION

PROBLEM - INEFFECTIVE CLEANING OF MACHINED SURFACES CAUSES METALLIC CONTAMINATION OF THE HYDRAULIC FLUID AFTER THE RECOIL SYSTEM IS ASSEMBLED. SUCH CONTAMINANTS ARE DIFFICULT TO REMOVE WITH NORMAL FLUSHING PROCEDURES.

SOLUTION - ESTABLISH AN AUTOMATED FLUSHING SYSTEM INCORPORATING HIGH PRESSURE TO REMOVE METALLIC CONTAMINATION FROM THE HYDRAULIC FLUID. THIS WILL REDUCE THE NUMBER OF REJECTIONS OF ASSEMBLED RECOIL MECHANISMS AFTER MECHANICAL GYMNASIATION.

4DD

(8612) TITLE - ELECTROSLAG REMELTING FOR WEAPON COMPONENTS

PROBLEM - CYLINDRICAL STEEL CASTINGS USED IN RECOIL CYLINDERS ARE OFTEN REJECTED DURING MACHINING BECAUSE OF POROSITY OR INCLUSIONS. DURING QUENCH, FORGED CYLINDRICAL PARTS CRACK DUE TO THESE INTERNAL DEFECTS.

SOLUTION - CAST THESE COMPONENTS USING ESR TO ELIMINATE HOT TEARING AND SHRINKAGE AND REDUCE THE LIKELIHOOD OF CRACKING DURING QUENCHING. COMPONENTS MADE WITH THIS PROCESS WILL BE RELATIVELY INCLUSION-FREE.

2DD

COMPONENT --- TUBES

(8024) TITLE - HIGH SPEED ABRASIVE BELT GRINDING

PROBLEM - SLIDE SURFACE DIAMETER AND FINISH IS PRESENTLY PRODUCED ON CYLINDRICAL GRINDING MACHINES USING ABRASIVE WHEELS. THE TIME IT TAKES FOR THIS OPERATION CAN BE SIGNIFICANTLY REDUCED.

SOLUTION - ABRASIVE BELT GRINDING DEPENDING ON ITS APPLICATION HAS METAL REMOVAL RATES WHICH CAN EXCEED MILLING OR GRINDING AT THE SAME TIME PRODUCING EXCELLENT TOLERANCES AND SURFACE FINISH.

324 142

(8050) TITLE - RECYCLING SPENT GUN TUBES BY ESR MELTING

PROBLEM - BECAUSE OF ANTICIPATED SHORTAGES IN THE AVAILABILITY OF CRITICAL ALLOYS, IT IS ADVANTAGEOUS TO UTILIZE SPENT GUN TUBES.

SOLUTION - TUBES WHICH CANNOT BE DIRECTLY ROTARY FORGED MIGHT BE REMELTED DIRECTLY BY ESR INTO INGOTS FOR USE ON THE ROTARY FORGE.

204

(8103) TITLE - HIGH VELOCITY MACHINING

PROBLEM - SPEED OF MACHINING CANNON TUBES IS LIMITED WITH CURRENT EQUIPMENT.

SOLUTION - EVALUATE HIGH SPEED METAL REMOVAL METHODS AND AVAILABLE EQUIPMENT. FUTURE YEARS FUNDING WILL PROVIDE FOR ACQUISITION AND TESTING OF NEW MACHINE AND PROCESS.

37 285 160 100



COMPONENT -- TUBES

(CONTINUED)

(8106) TITLE - LARGE CALIBER POWDER CHAMBER BORING

21B 72

PROBLEM - POWDER CHAMBERS PRODUCTION ON LARGE BORE CANNON, 8 IN M201, CURRENTLY REQUIRES 14 HOURS TO ACCOMPLISH BOTH ROUGH AND FINISH OPERATIONS.

SOLUTION - PERFORM THE FINISHING OPERATION IN THE SAME SETUP AS THE ROUGHING OPERATION BUT USING AS A CUTTING MEDIA DIAMOND FINISHING TOOLS WHICH AT VERY HIGH SPEEDS PRODUCE EXCELLENT SURFACE FINISH. THIS PROCESS WOULD ELIMINATE ONE GRINDING OPERATION.

(8151) TITLE - PORTABLE ENGRAVING SYSTEM

84 171

PROBLEM - CURRENTLY THE COMPONENT IDENTIFICATION LEGEND IS STAMPED BY HAMMER AND INDIVIDUAL ALPHA-NUMERIC STAMPS. THIS IS A TIME CONSUMING PROCESS WITH NO DEPTH CONTROL AND CAN PRESENT A SAFETY HAZARD TO PERSONNEL.

SOLUTION - PROVIDE A PROGRAMMABLE DATA ENGRAVING SYSTEM TO RELIEVE THE OPERATOR OF THE FATIGUE AND HAZARD OF HAND STAMPING. THIS WILL RESULT IN MORE UNIFORM SPACING AND DEPTH CONTROL AND REDUCE BOTH TIME AND COST.

(8241) TITLE - COMPUTER APPLICATIONS TO BORE GUIDANCE

30B 85

PROBLEM - THE BORE GUIDANCE SYSTEM CONSISTS OF MANY INTERDEPENDENT ELEMENTS MAKING IT DIFFICULT AND TIME CONSUMING TO DIAGNOSE PROBLEMS. ALSO, TUBES WITH LARGE WALL VARIATIONS GREATLY INCREASE THE DIFFICULTY IN MAINTAINING CONTROL.

SOLUTION - COMPUTER CONTROL WILL MAKE POSSIBLE SUCH FEATURES AS SELF TESTING, CHECKING, MONITORING, AND CALIBRATION IN CONTROL, TEST, AND MEASUREMENT SYSTEMS.

(8242) TITLE - DUAL PRESS LOADING

120

PROBLEM - ABOUT 20 PCT OF GUN TUBE FORGINGS REQUIRE STRAIGHTENING AT TEMPERATURES ABOVE 400 DEG F BECAUSE THE CRITERIA FOR 'COLD' STRAIGHTENING ARE RELATIVELY TIGHT. SINGLE LOADING INDUCES STRESSES THAT CREATE MACHINING PROBLEMS.

SOLUTION - A TWO POINT LOADING DEVICE WILL BE DESIGNED WHICH WILL APPLY LOADS AT TWO POINTS THUS REDUCING INDUCED STRESSES

(8243) TITLE - COMPUTER CONTROLLED CHROMIUM PLATING PROCESS

301 260

PROBLEM - CHROMIUM PLATING OF CANNON BARRELS IS A COMPLICATED, MULTI-STAGE PROCESS WHICH IS MANUALLY CONTROLLED. MANUAL MANIPULATION OF VALVE STRESS, SWITCHES, ETC., IS SLOW, SOMETIMES HAZARDOUS, AND CAN RESULT IN DEGRADED DEPOSIT QUALITY DUE TO HUMAN ERROR.

SOLUTION - THE CRITICAL STAGES OF THE CHROMIUM PLATING PROCESS WILL BE IDENTIFIED AND A PROGRAMMABLE CONTROLLER(S) DEVELOPED TO REDUCE TO NEAR ZERO THE MANIPULATION FUNCTIONS REQUIRED OF AN OPERATOR.

COMPONENT --- TUBES

(CONTINUED)

(8244) TITLE - OPTIMIZATION OF HEAT TREAT

29D

PROBLEM - ROTARY FORGED TUBES ARE CURRENTLY HEAT TREATED BASED ON HISTORICAL DATA. IF THE INITIAL CYCLE DOES NOT RESULT IN ADEQUATE PROPERTIES ADDITIONAL CYCLES ARE PERFORMED UNTIL ACCEPTABLE PROPERTIES ARE ATTAINED.

SOLUTION - INFORMATION ON EACH PREFORM TOGETHER WITH HISTORICAL DATA WILL BE USED TO DEVELOP A COMPUTER PROGRAM TO GENERATE HEAT TREAT PARAMETERS. THIS WILL GREATLY INCREASE THE PROBABILITY THAT THE REQUIRED PROPERTIES WILL BE OBTAINED ON THE FIRST CYCLE.

(8245) TITLE - LOW CONCENTRATION (LC) CHROMIUM PLATING

241 195

PROBLEM - HIGH CONCENTRATION CHROMIUM COATING IS CURRENTLY USED TO RESIST EROSION IN GUN BORES. INHERENT PROPERTIES MAKE THE COATING SUSCEPTABLE TO SHEARING AND FLAKING.

SOLUTION - PLATING WITH LOW CONCENTRATION CHROMIUM WILL GIVE A MARKED INCREASE IN WEAR RESISTANCE DUE TO ITS SUPERIOR CHARACTERISTICS.

(8246) TITLE - IMPROVED FINISHING OF GAS CHECK SEATS

6D 153

PROBLEM - MACHINING OF GAS CHECK SEATS IS A PRECISION PROCESS INVOLVING GRINDING AND LAPPING OF A CRITICAL AREA OF THE CANNON WHICH RESULTS IN 3D TO 50 PERCENT REMARK TO PASS CONTACT GAGE REQUIREMENTS.

SOLUTION - APPLY MORE PRECISE ALIGNMENT OF FINISHING EQUIPMENT AND ELIMINATE THE MACHINING FACILITY WHICH TENDS TO INDUCE ECCENTRICITY. THE GAUGING SYSTEM WILL ALSO BE REVIEWED.

(8259) TITLE - MACH/MARKING OF FIRE CONTROL REGISTERS

261

PROBLEM - DIFFICULTY IN MEASURING AND CORRECTLY MARKING THE FIRE CONTROL REGISTER, ON VARIOUS MID CALIBER WEAPON SYSTEMS, INDICATING COMPENSATION FOR MANUFACTURING VARIANCE DUE TO TOLERANCE ALLOWANCES.

SOLUTION - PROVIDE AN ANALOG LEVELING MEASURING SYSTEM WHICH WILL PROVIDE INPUT DATA FOR A SERVOCONTROLLED JACKING SYSTEM TO POSITION LEVEL A TUBE AT THE MUZZLE END AND A MEASURING SYSTEM FOR THE VARIATIONS AT THE BREECH LEVELING SITE.

(8341) TITLE - HOLLOW CYLINDER CUT OFF MACHINE

655

PROBLEM - ESTAB. CYL LENGTH IS DONE 1 OF 2 WAYS. PARTED OFF IN A LATHE AND FACED TO LENGTH OR SAWED OFF AND THEN SET UP IN A LATHE FOR FACING TO FINAL LENGTH DIMENSIONS. IN EITHER CASE, THE OPERATION REQUIRES DOUBLE HANDLING OR SLOW OPERATING PROCEDURES.

SOLUTION - NEW TECHNOLOGY IS BEING DEVELOPED WHEREBY A SET OF ROTATING CUTTERS MILLS THE CYLINDER TO LENGTH PRODUCING A FACE SURFACE TO SATISFY OUR TUBE LENGTH REQUIREMENTS CURRENT MACH. DESIGN WILL NOT PERFORM THIS FUNCTION BUT THE TECHNOLOGY IS APPLICABLE.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- TUBES

(CONTINUED)

(8346) TITLE - DEBURRING OF BORE EVACUATOR HOLES

270

PROBLEM - AN INABILITY TO SUCCESSFULLY AND CONSISTENTLY PRODUCE A SMOOTH RADIUS TO THE INTERNAL OPENING OF THE BORE EVACUATOR HOLES OF THE 120MM HAS LED TO EARLY CHROMIUM FAILURE.

SOLUTION - AN INTERNAL FIXTURE, ACTING AS A CARRIER FOR THE ANODE AND SOLUTION WILL BE DESIGNED AND FABRICATED. THE UNIT WILL BE CAPABLE OF DEBURRING THE INTERNAL AREA OF THE EVACUATOR HOLES BY USE OF ELECTRO-CHEMICAL POLISHING.

(8351) TITLE - IMP MFG OF QUADRANT FLATS ? MUZZLE BRAKE

350

PROBLEM - PRESENT METHODS OF MACHINING FLATS AND KEYWAYS REQUIRE TWO SET-UPS ON TWO SEPARATE MACHINE TOOLS WITH ATTENDANT MATERIEL HANDLING REQUIREMENTS.

SOLUTION - DESIGN A DUAL MACHINING SYSTEM CAPABLE OF MANUFACTURING BOTH THE KEYWAY AND THE LEVELING FLATS IN A SINGLE SET-UP, FABRICATE AND RETROFIT TO CURRENT EQUIPMENT.

(8352) TITLE - SKIVING OF GUN TUBE BORES

575

PROBLEM - INTERMEDIATE TUBE BORE HONING OPERATIONS FOR SURFACE FINISH AND SIZE CONTROL ARE A TIME CONSUMING, COSTLY METAL REMOVAL PROCESS. COUNTERBORING OPERATIONS PRIOR TO SWAGE AUTOFRETTAGE ARE ALSO SLOW, TIME CONSUMING, AND HIGH IN TOOLING COSTS.

SOLUTION - THE APPLICATION OF RECENTLY DEVELOPED SKIVING TECHNOLOGY AND EQUIPMENT WILL ELIMINATE COSTLY ROUGH HONING COUNTERBORING OPERATIONS.

(8354) TITLE - AUTO FLAME CUTTING OF HOT ROTARY FORGED TUBES

414

PROBLEM - CUT OFF OF MUZZLE AND BREECH ENDS OF ROTARY FORGED FORGINGS IS A BOTTLE NECK OPERATION PRIOR TO HEAT TREATING.

SOLUTION - AUTOMATIC FLAME CUTTING WILL ELIMINATE A BOTTLE NECK OPERATION AND REDUCE CUTTING TIME.

(8380) TITLE - CARBON/CARBON COMPOSITE STIFFENED LARGE CALIBER GUN TUBES

300

PROBLEM - REDUCED WEIGHT WITHOUT REDUCT OF ACCURACY. GRAPHITE FIBER REINFORCED COMPOSITE TUBE STIFFENERS CAN DECREASE WEIGHT AND IMPROVE ACCURACY, THE EPOXY MATRIX MATERIAL, CAN NOT SUSTAIN THE HIGH TEMPERATURE PRODUCED BY REPEATED RAPID FIRINGS.

SOLUTION - CARBON/CARBON COMPOSITES ARE STABLE TO TEMPERATURE FAR IN EXCESS TO THAT OF STEEL. A NEW MATRIX PRECURSOR IMPREGNANT REDUCES PROCESSING REQUIREMENTS SIGNIFICANTLY, THUS MAKING CARBON/ CARBON COMPOSITES A COST COMPETITIVE MATERIAL.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- TUBES

(CONTINUED)

(8431) TITLE - AUTOMATED WELDING OF BORE EVACUATORS

215

PROBLEM - PRESENT PROCEDURE DOES NOT ENABLE WELDING BORE EVACUATORS INSIDE AND OUTSIDE SIMULTANEOUSLY. THUS ENERGY AND TIME ARE WASTED.

SOLUTION - EMPLOY SPECIAL EQUIPMENT AND PROCEDURES TO PERMIT COMBINING THESE OPERATIONS.

(8433) TITLE - IN PROCESS CONTROL OF SELAS HEAT TREAT SYSTEM (CAM)

125

PROBLEM - AS GUN TUBES ARE HEAT TREATED THE ACTUAL WORKPIECE TEMPERATURE IS NOT KNOWN UNTIL THE PIECE EXITS THE FURNACE. EXCESSIVE FORGING TEMPERATURES CAN DEGRADE MECHANICAL PROPERTIES.

SOLUTION - AUTOMATICALLY CONTROL FURNACE TEMPERATURES BY MONITORING THE ACTUAL WORKPIECE TEMPERATURE, AND FEEDING THIS DATA TO MICROPROCESSORS.

(8439) TITLE - IMPROVED RIFLING PROCEDURES

80 200

PROBLEM - RIFLING HEADS USED TO HOLD BROACH CUTTERS IN THE RIFLING OPERATION ARE SUBJECT TO EXCESSIVE WEAR, NECESSITATING SIGNIFICANT MAINTENANCE AND REPAIR EXPENDITURE.

SOLUTION - DESIGN A NEW RIFLING HEAD THAT IS NOT SUBJECT TO WEAR, THEREBY ELIMINATING MAINTENANCE AND REPAIR EXPENDITURE ASSOCIATED WITH WORN RIFLING HEADS.

(8442) TITLE - IMPROVED CUTTING OF CHARPY AND TENSILE BLANKS

80 480

PROBLEM - CANNON TUBE TEST SPECIMEN BLANKS ARE SAWED MANUALLY. THIS METHOD IS TIME CONSUMING AND OFTEN RESULTS IN BLANKS THAT ARE OVERSIZED AND REQUIRE ADDITIONAL MACHINING OPERATIONS.

SOLUTION - ADAPT HIGH SPEED CUTTING PROCEDURES AND AUTOMATED HANDLING TECHNIQUES IN ORDER TO DECREASE MACHINING TIME AND ELIMINATE SUBSEQUENT MACHINING OPERATIONS.

(8449) TITLE - OPTIMAL RIFLING CONFIGURATION FOR CHROME PLATING

228 180

PROBLEM - EARLY FAILURE OF CHROMIUM COATINGS IN GUN TUBES OCCURS AT THE SHARP CORNERS OF THE LAND RUN-UP. PRESENTLY NO EFFECTIVE METHOD OR TOOL IS AVAILABLE TO ELIMINATE THIS CONDITION.

SOLUTION - DEVELOP A METHOD AND APPROPRIATE TOOLING TO ALTER THE RIFLING PROFILE OF GUN TUBES.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- TUBES

(CONTINUED)

(8473) TITLE - APPL FUSED SALT PROCESS TO COAT TANTALUM ON L CAL LINERS

245

PROBLEM - PRESENTLY NO FULL SCALE PRODUCTION CAPABILITY EXISTS AT WATERVLIET ARSENAL TO APPLY TANTALUM TO THE I. D. OF LARGE LINERS. THESE COATINGS MUST BE DEPOSITED FROM A FUSED SALT BATH.

SOLUTION - ESTABLISH THE CAPABILITY TO COAT LARGE CALIBER LINERS ON A PRODUCTION BASIS.

(8474) TITLE - APPL OF PARTIAL REFRACTORY LINERS TO CANNON TUBES

389 290

PROBLEM - FUTURE CANNON TUBES WILL BE SUBJECTED TO HIGHER TEMPERATURE, PRESSURE AND VELOCITY. TUBES AS NOW DESIGNED WILL WEAR OUT MUCH FASTER. PROTOTYPE EQUIPMENT TO INSTALL ADVANCED TECHNOLOGY LINERS IN TUBES NOW EXISTS.

SOLUTION - MODIFY THE EXISTING PROTOTYPAL FACILITY TO HANDLE ALL CURRENT AND FORESEEN REDUCTION TUBES. INSTALL ADVANCED TECHNOLOGY LINERS USING THIS EQUIPMENT.

(8621) TITLE - SPRAY ROLLING FOR TUBE MANUFACTURE

750

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*QUALITY CONTROL/TESTING \*  
\*\*\*\*\*

COMPONENT -- FIRE CONTROL

(8561) TITLE - DIGITAL IMAGE DIAGNOSTIC TECHNIQUES

350 300

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

COMPONENT -- GUN SYSTEMS

(8370) TITLE - AUTOMATED INSPECTION OF WEAPONS COMPONENTS

193 359 337

PROBLEM - FOR BARREL MRG, CURRENT HAND GAGED INSPECTION IS A MAJOR TIME FACTOR. BARREL STRAIGHTENING IS ALSO DONE MANUALLY AS MANY AS 13 TIMES DURING THE MFG CYCLE. NEW DNC EQUIP BEING PROCURED VIA PIF 68X7986 REQUIRES CENTRAL CONTROL.

SOLUTION - AUTOMATE, TO MAX FEASIBLE DEGREE, INSPECTION OPERATIONS. USING LASER TECHNOLOGY, EQUIP A STRAIGHTENING PRESS WITH FEEDBACK CONTROL TO SELECT LOCATION FOR APPLICATION OF BENDING FORCES. CONTROL ALL DNC EQUIPMENT WITH A CNC MASTER UNIT.

COMPONENT --- GUN SYSTEMS

(CONTINUED)

(8415) TITLE - ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)

709 476

PROBLEM - RADIOGRAPHIC INSPECTION IS USED EXTENSIVELY TO ASSURE THE QUALITY OF HOWITZER CARRIAGES DURING MFG. TO OBTAIN SATISFACTORY X-RAYS ALIGNMENT IS CRITICAL. USING THE PRESENT METHOD CONSISTENCY OF EXPOSURE IS IMPOSSIBLE.

SOLUTION - REPLACE THE MANUAL RADIOGRAPHIC POSITIONING WITH AN AUTOMATED ROBOTIC DEVICE CAPABLE OF PRECISELY ALIGNING WELDMENTS AND CASTING

(8434) TITLE - EDDY CURRENT INSPECTION OF GUN TUBES

118

PROBLEM - THE CURRENT GUN TUBE PRODUCTION ID INSPECTION TECHNIQUES, BORESCOPE AND MAGNETIC PARTICLE, ARE SLOW AND SUBJECT OPERATOR ERROR. THESE TECHNIQUES DO NOT HAVE THE CAPABILITY TO PRODUCE PERMANENT RECORDS OF FLAW LOCATIONS.

SOLUTION - DEVELOP A EDDY CURRENT INSPECTION SYSTEM HAS THE CAPABILITY TO DETECT AND PERMANENTLY RECORD SURFACE CRACKS UP .010 INCHES DEEP DURING THE MACHINING PROCESS. THIS TECHNIQUE WILL ADD ONLY ONE MINUTE TO THE MACHINING PROCESS

(8436) TITLE - QUENCH CYCLE PROFILE MEASUREMENT SYSTEM

284

PROBLEM - THE QUENCH CYCLE DURING HEAT TREAT PLAYS AN IMPORTANT PART IN THE QUALITY OF GUN TUBE FURCINGS. QUENCH CRACKS HAVE BEEN OCCURING IN THE NUZZLE END OF 105MM ROTARY FURGED GUN TUBES. THE CURRENT QUENCH CYCLE HAS LITTLE OR NO CONTROL.

SOLUTION - DEVELOP A NONCONTACT EDDY CURRENT AND/OR NONCONTACT EMAT(ELECTROMAGNETIC ACUSTICAL TRANSMISSION) ULTRASONIC SYSTEM TO PROVIDE QUENCH CYCLE TEMPERATURE TIME TRANSFORMATION INFORMATION ON REAL TIME BASIS.

COMPONENT -- MISCELLANEOUS

(8253) TITLE - MACHINE TOOL DYNAMIC MEASUREMENTS AND DIAGNOSTICS

19D

PROBLEM - VIBRATIONS IN MACHINE TOOLS CAN CAUSE POOR MACHINING OPERATIONS AND BREAKDOWNS. IT IS ESSENTIAL TO RAPIDLY DETERMINE BOTH THE CAUSE OF THE CHATTER AND MACHINE TOOL PROBLEMS BEFORE THEY CAUSE A FAILURE.

SOLUTION - A MEASUREMENT INSTRUMENT IS NEEDED TO ANALYZE ITS VIBRATIONS AND NOTIFY PERSONNEL WHAT CORRECTIVE ACTION IS NECESSARY, I.E., MACHINE SPINDLE AND PULLEY SHOULD BE BALANCED.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*SMALL CALIBER \*  
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FUNDING (\$000)

PRIOR B2 B3 B4 B5 B6

COMPONENT --- TUBES

(CONTINUED)

(8473) TITLE - APPL FUSED SALT PROCESS TO COAT TANTALUM ON L CAL LINERS

245

PROBLEM - PRESENTLY NO FULL SCALE PRODUCTION CAPABILITY EXISTS AT WATERVLIET ARSENAL TO APPLY TANTALUM TO THE I. D. OF LARGE LINERS. THESE COATINGS MUST BE DEPOSITED FROM A FUSED SALT BATH.

SOLUTION - ESTABLISH THE CAPABILITY TO COAT LARGE CALIBER LINERS ON A PRODUCTION BASIS.

(8474) TITLE - APPL OF PARTIAL REFRACTORY LINERS TO CANNON TUBES

389 290

PROBLEM - FUTURE CANNON TUBES WILL BE SUBJECTED TO HIGHER TEMPERATURE, PRESSURE AND VELOCITY. TUBES AS NOW DESIGNED WILL WEAR OUT MUCH FASTER. PROTOTYPE EQUIPMENT TO INSTALL ADVANCED TECHNOLOGY LINERS IN TUBES NOW EXISTS.

SOLUTION - MODIFY THE EXISTING PROTOTYPAL FACILITY TO HANDLE ALL CURRENT AND FORESEEN REDUCTION TUBES. INSTALL ADVANCED TECHNOLOGY LINERS USING THIS EQUIPMENT.

(8621) TITLE - SPRAY ROLLING FOR TUBE MANUFACTURE

750

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*QUALITY CONTROL/TESTING\*  
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COMPONENT --- FIRE CONTROL

(8561) TITLE - DIGITAL IMAGE DIAGNOSTIC TECHNIQUES

350 300

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

COMPONENT --- GUN SYSTEMS

(837D) TITLE - AUTOMATED INSPECTION OF WEAPONS COMPONENTS

193 359 337

PROBLEM - FOR BARREL MRG, CURRENT HAND GAGED INSPECTION IS A MAJOR TIME FACTOR. BARREL STRAIGHTENING IS ALSO DONE MANUALLY AS MANY AS 13 TIMES DURING THE MFG CYCLE. NEW DNC EQUIP BEING PROCURED VIA PIF 68X7986 REQUIRES CENTRAL CONTROL.

SOLUTION - AUTOMATE, TO MAX FEASIBLE DEGREE, INSPECTION OPERATIONS. USING LASER TECHNOLOGY, EQUIP A STRAIGHTENING PRESS WITH FEEDBACK CONTROL TO SELECT LOCATION FOR APPLICATION OF BENDING FORCES. CONTROL ALL DNC EQUIPMENT WITH A CNC MASTER UNIT.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- GUN SYSTEMS

(CONTINUED)

(8415) TITLE - ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)

PROBLEM - RADIOGRAPHIC INSPECTION IS USED EXTENSIVELY TO ASSURE THE QUALITY OF HOWITZER CARRIAGES DURING MFG. TO OBTAIN SATISFACTORY X-RAYS ALIGNMENT IS CRITICAL. USING THE PRESENT METHOD CONSISTENCY OF EXPOSURE IS IMPOSSIBLE.

SOLUTION - REPLACE THE MANUAL RADIOGRAPHIC POSITIONING WITH AN AUTOMATED ROBOTIC DEVICE CAPABLE OF PRECISELY ALIGNING WELDMENTS AND CASTING

709 476

(8434) TITLE - EDDY CURRENT INSPECTION OF GUN TUBES

PROBLEM - THE CURRENT GUN TUBE PRODUCTION ID INSPECTION TECHNIQUES, BORESCOPE AND MAGNETIC PARTICLE, ARE SLOW AND SUBJECT OPERATOR ERROR. THESE TECHNIQUES DO NOT HAVE THE CAPABILITY TO PRODUCE PERMANENT RECORDS OF FLAW LOCATIONS.

SOLUTION - DEVELOP A EDDY CURRENT INSPECTION SYSTEM HAS THE CAPABILITY TO DETECT AND PERMANENTLY RECORD SURFACE CRACKS UP .010 INCHES DEEP DURING THE MACHINING PROCESS. THIS TECHNIQUE WILL ADD ONLY ONE MINUTE TO THE MACHINING PROCESS

118

(8436) TITLE - QUENCH CYCLE PROFILE MEASUREMENT SYSTEM

PROBLEM - THE QUENCH CYCLE DURING HEAT TREAT PLAYS AN IMPORTANT PART IN THE QUALITY OF GUN TUBE FORCINGS. QUENCH CRACKS HAVE BEEN OCCURRING IN THE NUZZLE END OF 105MM ROTARY FORGED GUN TUBES. THE CURRENT QUENCH CYCLE HAS LITTLE OR NO CONTROL.

284

SOLUTION - DEVELOP A NONCONTACT EDDY CURRENT AND/OR NONCONTACT EMAT(ELECTROMAGNETIC ACUSTICAL TRANSMISSION) ULTRASONIC SYSTEM TO PROVIDE QUENCH CYCLE TEMPERATURE TIME TRANSFORMATION INFORMATION ON REAL TIME BASIS.

COMPONENT --- MISCELLANEOUS

(8253) TITLE - MACHINE TOOL DYNAMIC MEASUREMENTS AND DIAGNOSTICS

PROBLEM - VIBRATIONS IN MACHINE TOOLS CAN CAUSE POOR MACHINING OPERATIONS AND BREAKDOWNS. IT IS ESSENTIAL TO RAPIDLY DETERMINE BOTH THE CAUSE OF THE CHATTER AND MACHINE TOOL PROBLEMS BEFORE THEY CAUSE A FAILURE.

SOLUTION - A MEASUREMENT INSTRUMENT IS NEEDED TO ANALYZE ITS VIBRATIONS AND NOTIFY PERSONNEL WHAT CORRECTIVE ACTION IS NECESSARY, I.E., MACHINE SPINDLE AND PULLEY SHOULD BE BALANCED.

190

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\* SMALL CALIBER \*  
\*\*\*\*\*

FUNDING (\$DDDD)

PRIOR 82 83 84 85 86

COMPONENT — BARRELS

(7985) TITLE — SMALL ARMS WEAPONS NEW PROCESS PRODUCTION TECHNOLOGY

PROBLEM — GUN BARREL MFG PROCEDURES REFLECT ANTIQUATED TECHNOLOGY AND RELY ON MASS REMOVAL OF MATERIAL BY CONVENTIONAL MACHINING METHODS. CURRENT EQUIP REPRESENTS 1940-50 TECHNOLOGY. NEW MATERIALS COMPOUND THE PROBLEM.

SOLUTION — REDUCE TO PRACTICE NEW TECHNIQUES FOR CAL 50 TO 40MM BARRELS BY ESTABLISHING THE TECHNOLOGY AND PROCESS EQUIPMENT REQUIRED TO BRIDGE GAP BETWEEN CAPABILITIES AND REQUIREMENTS.

818 620 813 728 813

(8266) TITLE — INVESTMENT CAST LINERS OF SUBSTITUTE ALLOYS

PROBLEM — AN ALTERNATE INVESTMENT-CAST GUN TUBE LINER MATERIAL IS REQUIRED TO SERVE AS A BACKUP AND/OR REPLACEMENT FOR THE CURRENT STRATEGIC COBALT-BASE INVESTMENT CAST ALLY.

SOLUTION — ESTABLISH VACUUM MELTING AND CASTING CAPABILITIES FOR THE INVESTMENT CASTING OF GUN TUBE LINERS.

125 474

(8524) TITLE — REFRACTORY METAL COATING FOR GUN TUBES

PROBLEM — THERE IS A NEED TO PROVIDE IMPROVED RAPID FIRE GUN TUBES, AND A NEED TO REPLACE LINER MATERIALS MADE OF COBALT AND ITS ALLOYS (A CRITICAL STRATEGIC MATERIAL).

SOLUTION — DEVELOP AND OPTIMIZE THE PROCESS VARIABLES OF THE REFRACTORY METAL COATINGS AND THE APPLICATION PROCEDURES OF THESE COATINGS ON GUN BARREL LINERS.

320

(8533) TITLE — TECHNOLOGY FOR EROSION RESISTANT COATING FOR GUN BARRELS

PROBLEM — GUN GARRELS SUFFER EROSION AT THE BREECH END OF THE WEAPON. CERAMICS OR REFRACTORY METALS MAY OFF-SET EROSION BUT THE PROBLEM OF LINING THE BARREL WITH THESE MATERIALS HAS NOT BEEN RESOLVED ON FULL SCALE WEAPONS.

SOLUTION — DEMONSTRATE THE APPLICATION OF COATINGS AND/OR LINERS ON SMALL AND LARGE CAL BARRELS. A CERAMIC (PERHAPS TITANIUM DIBORIDE) WOULD BE BEST IN SMALL BARRELS WHEREAS A REFRACTORY METAL (PERHAPS COLUMBIUM) WOULD BE BEST SUITED FOR LARGE BARRELS.

260

297

(8536) TITLE — MOLYBDENUM ALLOY GUN BARREL LINERS

PROBLEM — METHODS FOR PROCESSING MOLYBDENUM ALLOY ARE BEING STUDIED SO THAT ITS UNIQUE PROPERTIES CAN BE USED FOR SUSTAINED RAPID FIRE WEAPONS. IT WILL BE NECESSARY TO ESTABLISH AND APPLY THE METHODS ON AN ADEQUATE SCALE.

SOLUTION — THE APPLICABILITY OF ONE OR MORE METHODS (HOT ISOSTATIC PRESSING, EXTRUSION, INJECTION MOLDING, ETC) WILL BE DEMONSTRATED. SPECIFICATIONS FOR MATERIALS AND PROCESSES WILL BE ESTABLISHED.

645

817

MMT FIVE YEAR PLAN  
RCS DRCHT 126

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT --- COMPONENTS

(18471) TITLE - SQUEEZE CASTING OF SMALL CAL WEAPONS

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

350 430

COMPONENT --- GENERAL

(18324) TITLE - PROCESS CONTROLS FOR P/M WEAPONS COMPONENTS

PROBLEM - PRESENT METHODS OF PRODUCING WEAPON COMPONENTS IS MAINLY BY MACHINING FROM BROUGHT STOCK. THIS IS A HIGH COST METHOD WHICH PRODUCES MUCH ALLOY STEEL SCRAP.

SOLUTION - FORGE PARTS FROM P/M STEEL FOR SAVINGS AND INCREASED DURABILITY AND REDUCED USE OF ALLOY STEEL.

184 368 391

(18468) TITLE - IMPR MFG PLUS HANDLING TECHNIQUES FOR SMALL CAL WEAPONS

PROBLEM - CURRENT MANUAL MATERIALS HANDLING AND ASSEMBLY TECHNIQUES CAUSE NON-OPTIMAL MACHINE UTILIZATION AND HIGH LABOR COSTS.

SOLUTION - DEMONSTRATE THE APPLICATION OF A MODIFIED GENERAL PURPOSE INDUSTRIAL ROBOT IN A PRODUCTION ENVIRONMENT FOR MATERIALS HANDLING. DEMONSTRATE THE APPLICATION OF A FLEXIBLY PROGRAMMED ASSEMBLY MACHINE FOR SMALL WEAPONS COMPONENTS.

180 565 666

(18525) TITLE - GROUP TECHNOLOGY FOR S/C COMPONENT

PROBLEM - PRIOR YEAR ICAM RELATED MMT PROJECTS DEVELOPED PRUCES PLANNING AND PAST CLASSIFICATION SOFTWARE. HOWEVER NO DATA BASE HAS BEEN ASSEMBLED TO PERMIT THE SELECTION OF AN OPTIMUM PROCESS FOR A GIVEN PART OR ESTIMATING COSTS RELATED TO SUCH A PROCESS.

SOLUTION - A DATA BASE WILL BE DEVELOPED FOR FAMILIES OF MAJOR SMALL CALIBER 5.56MM -40MM WEAPONS COMPONENTS USING SOFTWARE ALREADY IN USE IN OTHER AREAS. DATA ON NEW PRODUCT CONFIGURATIONS WILL BE PROGRAMMED AND PROCESS PLANNING SYSTEMS EXERCISED.

300

(18526) TITLE - PROCESSING OF HIGH STRENGTH/LIGHT WEIGHT WEAPONS COMPONENTS

PROBLEM - UTILIZATION OF METAL MATRIX TECHNOLOGY WILL DEPEND ON THE DEVELOPMENT OF A MFG BASE FOR THE ECONOMICAL FABRICATION OF HETEROGENEOUS MATERIALS. BY 1985, MATERIAL SYSTEMS AND PROCESSING/PROPERTY RIGHTS WILL HAVE BEEN IDENTIFIED.

SOLUTION - DEFINE MATERIAL COMBINATIONS/PROPERTIES AND PROCESSING. PROTOTYPE FABRICATE COMPONENTS BY MORE ONE CONTRACTOR. EVALUATE THE MATERIAL BY RIGOROUS LAB TESTING AND IDENTIFY INSPECTION PROCEDURES.

300

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT -- GENERAL

(CONTINUED)

(8528) TITLE - FABRICATION OF COMPOSITE WEAPON COMPONENTS

PROBLEM - CONVENTIONAL WEAR RESISTANCE SURFACE COATINGS ARE APPLIED BY ELECTROPLATING AND ARE OFTEN BRITTLE, HAVE VARIABLE COMPOSITION AND STRUCTURE AND ARE LIMITED IN APPLICATION BY GEOMETRICAL CONSTRAINTS.

SOLUTION - EXTEND THE USE OF MULTI-LAYER MATERIALS (COPPER ALLOY/STEEL) PRODUCED BY THE P/M PROCESS WHICH ARE CURRENTLY BEING USED FOR BEARINGS TO FORM WEAR AND EROSION RESISTANT LAYERS.

(8530) TITLE - LIGHTWEIGHT P/M WEAPON COMPONENTS

PROBLEM - MODERN WEAPONS REQUIRE THAT MATERIALS HAVE A HIGH SPECIFIC STRENGTH (STRENGTH TO DENSITY RATIO) IN ORDER TO REDUCE THEIR WEIGHT.

SOLUTION - THE AF AND NAVY HAVE DEVELOPED METAL MATRIX COMPOSITE MATERIALS THAT HAVE HIGHER SPECIFIC STRENGTHS THAN STEEL OR ALUMINUM ALLOYS. DEVELOP THE PROCESSING PARAMETERS FOR PRODUCING THESE MATERIALS INTO WEAPON COMPONENTS.

(8662) TITLE - FABRICATION OF PM WEAPON COMPONENTS

PROBLEM - THE ARMY HAS BEEN SLOW TO TAKE ADVANTAGE OF THE POWDER METALLURGY PROCESS DUE TO THE LOW CORRELATION BETWEEN WROUGHT AND PM STEELS AND THE RESULTING CONFUSION CAUSED IN PROCUREMENT WHEN A PM PART IS SPECIFIED AS AN ALTERNATE TO A WROUGHT PART.

SOLUTION - DEVELOP MILITARY PROCESS SPECS FOR HIGH DENSITY AND COPPER INFILTRATED STEELS TO PERMIT INTERCHANGEABILITY BETWEEN WROUGHT AND PM WEAPON COMPONENTS, THUS AVOIDING THE NEED TO CHANGE THE DRAWING OR TDP FOR EACH COMPONENT.

COMPONENT -- MISCELLANEOUS

(8670) TITLE - PROCESS CONTROL IMPROVEMENT IN SMALL CAL WEAPON FAB

COMPONENT -- SPRINGS

(8267) TITLE - STRESS PEENING OF HELICAL COMPRESSION SPRING

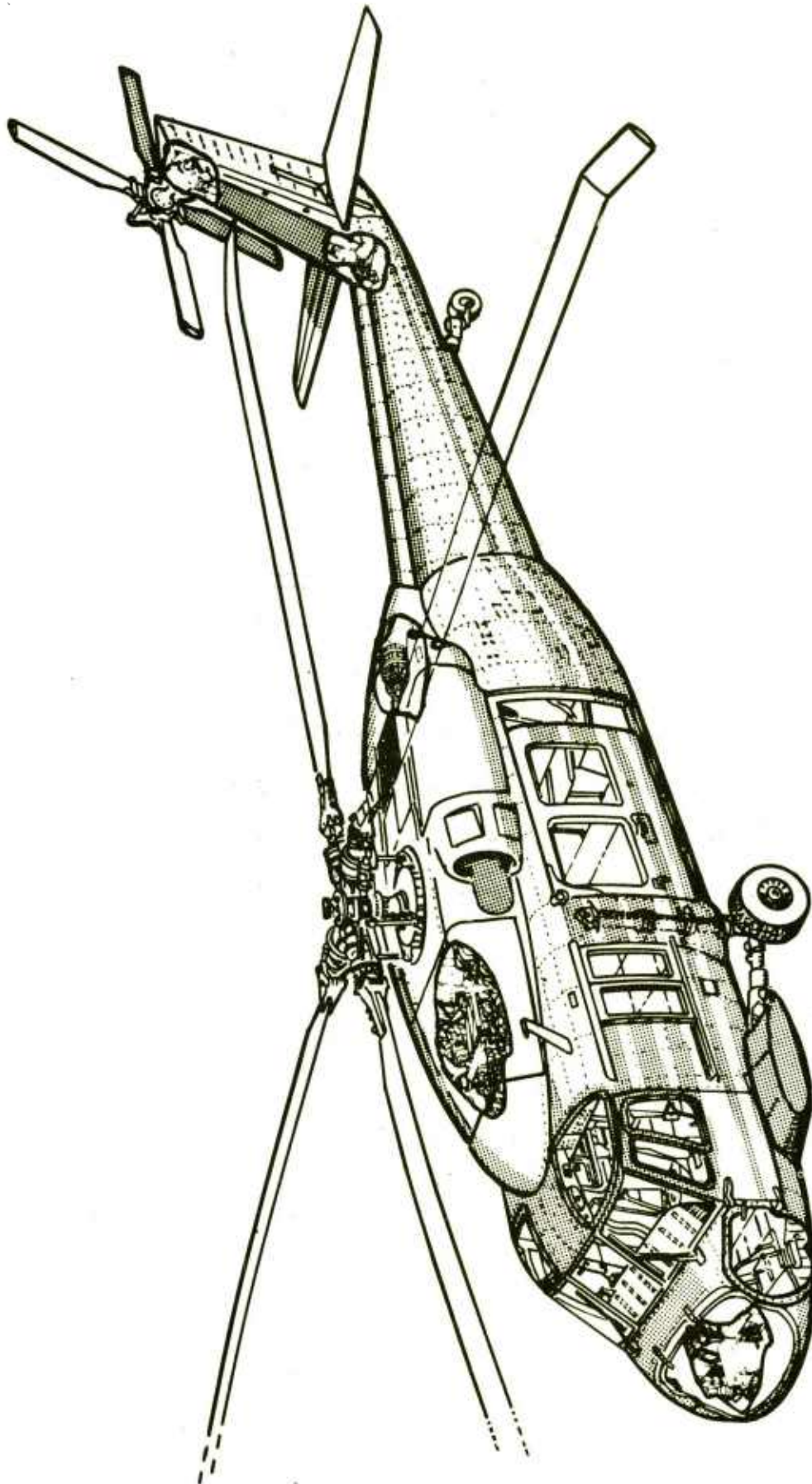
PROBLEM - THE FATIGUE LIFE AND RELIABILITY OF CRITICAL SPRINGS IN SOME WEAPON SYSTEMS IS LESS THAN DESIRABLE.

SOLUTION - IMPROVE THE FATIGUE LIFE AND RELIABILITY OF THE WEAPON SPRINGS BY OPTIMIZING THE PRODUCTION PROCESS PARAMETERS SUCH AS SHOT SIZE, SHOT INTENSITY, AND SPRING STRESS LEVEL.

109

320





**AVIATION R&D COMMAND  
(AVRADCOM)**



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## US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND

(AVRADCOM)

The US Army Aviation Research and Development Command (AVRADCOM), with headquarters at St. Louis, MO, is responsible for Army aviation research, development, product improvement, acquisition of assigned materiel, initial procurement, and production. The Command directs the Research and Technology Laboratories with headquarters at NASA - Ames Research Center, Moffett Field, CA; US Army Avionics Agency and Laboratory, Fort Monmouth, NJ; Applied Technology Laboratory at Ft. Eustis, VA; US Army Bell Plant Activity, Fort Worth, TX; and the US Army Hughes Plant Activity, Culver City, CA. Three project managers, Aircraft Survivability Equipment, CH-47 Modernization Program, and Navigation/Control Systems, are located at AVRADCOM. PM Advanced Attack Helicopter (AAH) and PM Blackhawk are located at AVRADCOM, but are under the direct control of HQ, DARCOM.

The overall emphasis of the Army's aviation MMT program is to perfect technologies which have a good probability of implementation and high potential benefits. For the most part, efforts are directed towards projects which offer both cost reductions and product improvements. The results of these projects will be made available to other Government agencies and to Industry.

The most important criteria of aircraft materials are strength and low weight. A large part of the aviation MMT program is dedicated to establishing processes to replace metals with materials which have better strength to weight ratios. Composite materials suitable for aviation have been developed and are being used; however, techniques for the production and application of composites need further development to achieve increased use.

The use of composite materials in Army aircraft is anticipated to increase as a result of current work in R&D and MT leading to an all-composite helicopter fuselage. Raw material costs are expected to decrease with the increased use of composites in DOD and Industry. Also, as confidence in the use of composites increases, reservations held by the design and (quality control groups) will diminish, and composites will be incorporated in the earliest stages of weapon development. This will result in increases in MMT work.

Composite projects are planned for virtually every part of the helicopter. Several projects are planned in the airframe area. One will establish manufacturing methods for application of composites to a main fuselage primary structure (the rear fuselage of the Blackhawk). A project planned in the rotor area will establish a manufacturing process for the main rotor blade of the Blackhawk. In the drive area, one project will focus on the drive shaft and another will result in methods for manufacturing a gearbox housing.

Several projects will attack technical problem areas that affect all composite manufacturing. These projects address automation of cutting and layup operations, and improvements in machining, fastening, and new materials. The development of automated techniques will be pursued in cooperation with the Air Force, the lead service in this area.

Perhaps the most significant project areas in terms of advancing composites manufacturing and usage is in the development of improved and new quality control techniques. Projects planned in this area will address materials characterization, in-process controls, and non-destructive evaluation. These projects will ensure optimum processing and material performance, which will increase confidence in composites.

There are many areas in aircraft in which metals can not be replaced. Projects have been submitted to improve production of these items. Since many aircraft metals used in the propulsion system are tough and expensive, machining to final shape is difficult and produces costly scrap. Improving powder metal technology will provide components much closer to final shape, greatly reducing the time and effort to produce the final product. Several projects are included to implement recent advances in gear manufacturing and should provide an improved item at a lower cost. Projects are also planned to find ways of repairing rather than scrapping complex items which are damaged in the manufacturing process. An effort is planned to replace metal turbine blades with ceramic blades. This will provide better operating characteristics at lower cost.

AVRADCOM

C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY -----	FY82 ----	FY83 ----	FY84 ----	FY85 ----	FY86 ----
AIRFRAME	673	350	1110	6705	8025
AVIONICS	250	700	1215	1100	2805
DRIVE SYSTEM	849	1070	2665	7050	8270
FACTORY MODERNIZATION	110	0	17000	21500	15000
GENERAL	0	0	375	140	360
ROTOR SYSTEM	6700	6630	675	2800	4570
TURBINE ENGINE	3952	860	3805	11845	13935
TOTAL	12534	9610	26845	51140	52965

MMT FIVE YEAR PLAN  
RCS DRCHT 126

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\* C A T E G O R Y \*  
\*-----\*  
\*AIRFRAME\*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR B2 B3 B4 B5 B6

# COMPONENT --- FUSELAGE STRUCTURES

(7113) TITLE - COMPOSITE REAR FUSELAGE MANUFACTURING TECHNOLOGY

2389 200

PROBLEM - APPLICATION OF COMPOSITE MATERIALS TO AIRFRAME FUSELAGE COMPONENTS POSSESSES A LARGE POTENTIAL FOR COST AND WEIGHT SAVINGS. HOWEVER, PRODUCTION MANUFACTURING PROCESSES HAVE NOT BEEN ESTABLISHED FOR LARGE, FULL-SCALE, COMPOUND CURVATURE, COMPONENTS.

SOLUTION - PROJECT WILL ESTABLISH TECHNOLOGY FOR FABRICATING MOLDED COMPOSITE REAR FUSELAGE STRUCTURES, WITH EMPHASIS ON BLACKHAWK. LOW COST TOOLING, FORMING MOLDS, AND CO-CURING PROCESSES WILL BE DEVELOPED TO INSURE HIGH REPEATABILITY AND INTEGRITY.

(7387) TITLE - LOW COST RADAR CAMOUFLAGE AIRFRAME MATERIAL

100 260

PROBLEM - CURRENT CONST TECH FOR INTEGRAL RADAR CAMOUFLAGED, LOAD BEARING AIRFRAME MATERIALS REQUIRE LABOR INTENSIVE SECONDARY FABRICATION STEPS FOR INTEGRATING CAMOUFLAGED COMPONENTS INTO AIRFRAME STRUCTURES.

SOLUTION - DEVELOP MATERIALS AND CONSTRUCTION TECHNIQUES WHICH PERMIT DIRECT INCORPORATION OF CAMOUFLAGE MATERIALS WITHIN THE COMPOSITE STRUCTURE. THIS WILL REDUCE THE OVERALL COST OF THE AIRFRAME STRUCTURE.

# COMPONENT --- GENERAL

(7001) TITLE - MFG TECHNOLOGY FOR AIRFRAME AND SECONDARY STRUCT

3200 5000

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE AIRFRAME AND SECONDARY STRUCTURES FROM EXISTING NEW METALLIC OR NONMETALLIC MATERIALS AT SUBSTANTIALLY LOWER COSTS.

(7302) TITLE - PROD OF T1B2 COATED LONG LIFE TOOLS

225 265 130

PROBLEM - AIRFRAME COMPOSITE COMPONENTS REQUIRE EXTENSIVE MACHINING WHICH IS EXPENSIVE IN TERMS OF LABOR HOURS REQUIRED AND TOOL COSTS.

SOLUTION - MANUFACTURE OF T1B2 COATED TOOLS WILL BE SCALED UP FROM LAB-SIZED ELECTROLYTIC CELLS (15 LBS) TO PRODUCTION SIZE (ABOUT 300 LBS) WITH THE CAPABILITY TO PLATE VARIOUS TOOL TYPES AND SHAPES. TOTAL TOOLING COST WILL BE ABOUT 20 PCT OF CURRENT.

(7456) TITLE - LOW COST TOOLING FOR AIRFRAME AND ROTOR COMPONENTS

500 750

PROBLEM - HIGH COST METAL TOOLING CONCEPTS OR EXPENSIVE AUTOCLAVE CURING APPROCHES HAVE BEEN USED WHICH RESULT IN EXTENDED CURE CYCLES AND POOR ENERGY CONSERVATION.

SOLUTION - ESTABLISH TECHNOLOGY FOR THE USE OF SELF-CONTAINED INTEGRALLY HEATED PLATING PRESS TOOLING. THIS WILL ALLOW COMPOSITE COMPONENTS TO BE FABRICATED AT LOW COST DUE TO RAPID CURE TIME AND PRODUCTIBILITY.

FUNDING (\$000)

PRIOR B2 B3 B4 B5 B6

COMPONENT -- MISC COMPONENTS

(7386) TITLE - INTEGRAL LOW COST FASTENING SYSTEMS FOR RPVS

PROBLEM - JOINING OF COMPONENTS IN RPV SYSTEMS IS ACCOMPLISHED BY THE TRADITIONAL SCREW, NUT, AND BOLT METHODS. UTILIZATION OF THESE METHODS ADD HIGH FABRICATION AND ASSEMBLY COST AND WEIGHT TO THE SYSTEM.

SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZATION AND INTEGRATION OF PLASTIC FASTENERS, SNAP LATCHES, AND OTHER LOW COST MANUFACTURE AND ASSEMBLY TECHNIQUES INTO THE PRODUCTION OF RPV SYSTEMS.

175 150

COMPONENT -- SECONDARY STRUCTURES

(7183) TITLE - SEMI-AUTO COMPOSITE MFG SYS FOR FUSELAGE SEC STRUCT

PROBLEM - HELICOPTER FUSELAGE STRUCTURES HAVE HIGH MANUFACTURING COST DUE TO HIGH PART COUNT AND HIGH ASSEMBLY COSTS. METHODS OF COMPOSITE FABRICATION HAVE BEEN INVESTIGATED BUT HAND OPERATIONS RESULT IN HIGH LABOR COSTS.

SOLUTION - USE EQUIPMENT AND TECHNIQUES DEVELOPED BY INDUSTRY IN SUPPORT OF AIR FORCE COMPOSITE COMPONENT PROGRAMS. THE SELECTED SYSTEM WILL BE UPDATED AND MODIFIED TO ACCOMMODATE HELICOPTOR COMPONENTS WHICH ARE MORE COMPLEX AND HAVE MORE CURVATURE THAN AF CUMP.

78D 10D

(7344) TITLE - RIM MOLDING OF LOW COST SECONDARY STRUCTURES

PROBLEM - PRESENT METHODS OF FABRICATING AIRCRAFT SECONDARY STRUCTURES (ESPECIALLY ACCESS DOORS) INVOLVE EXCESSIVE LABOR AND EXPENSIVE MATERIALS. STRUCTURES MADE FROM FIBER REINFORCED SANDWICH PANELS AND/OR FORMED SHEET METAL OFTEN REQUIRE COMPLEX ASSEMBLY.

SOLUTION - ESTABLISH A PROCESS TO PRODUCE THESE SECONDARY STRUCTURES FROM REACTION INJECTED MELDED (RIM) URETHANES. RIM IS A LOW PRESSURE MOLDING TECHNIQUE WHICH CAN USE LOW COST COMPOSITE MOLDS TO GIVE EXTREMELY COST EFFECTIVE STRUCTURES.

175 225

(7385) TITLE - COMPOSITE ENGINE INLET

PROBLEM - MOLDING COMPOSITES TO SHAPES SUCH AS THAT OF THE BLACK HAWK INLET IN PRODUCTION HAS NOT BEEN DEMONSTRATED.

SOLUTION - ESTABLISH A PRODUCT+--- MOLDING PROCESS FOR MANUFACTURING AN INLET COMPOSED OF ALUMINIZED GLASS FIBERS IN A POLYAMINE MATRIX.

350 400

(7390) TITLE - FIBER REINFORCED THERMOPLASTIC STRUCTURE

PROBLEM - HELICOPTER SECONDARY AIRFRAME STRUCTURES ARE EXPENSIVE AND A FREQUENT CAUSE OF DOWNTIME. THE CONTINUAL REPAIR AND REPLACEMENT OF THESE ITEMS IS A MAJOR AIRFRAME OPERATIONAL COST FACTOR.

SOLUTION - ESTABLISH A MANUFACTURING METHOD TO INCORPORATE HIGH STRENGTH AND HIGH MODULUS FIBERS INTO THERMOPLASTIC FOR HELICOPTER STRUCTURES.

350 290



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- STRUCTURAL MEMBERS

(7193) TITLE - ADV FILAMENT WNDG FOR AIRCRAFT COMPONENTS

350

PROBLEM - CURRENT COMMERCIAL PRACTICES ON FILAMENT WINDING ARE EXPENSIVE.

SOLUTION - A NUMBER OF RECENT DEVELOPMENTS IN FILAMENT WINDING TECHNOLOGY ORIGINATING IN THE U.S., DENMARK, AND HUNGARY SHOW PROMISE OF EXPANDING THE FLEXIBILITY OF THE FILAMENT WINDING PROCESS.

(7342) TITLE - PULTRUSION OF HONEYCOMB SANDWICH STRUCTURES

285 93

PROBLEM - FABRICATION OF HONEYCOMB SANDWICH PANELS IS LABOR INTENSIVE AND FACE-TO-CORE BONDING OFTEN TAKES TWO CURE OPERATIONS. PULTRUSION CAN BE USED FOR CONTINUOUS PRODUCTION BUT COMMERCIAL PARAMETERS AND TOOLING ARE NOT SUITABLE FOR MILITARY USE.

SOLUTION - ESTABLISH TECHNOLOGY NECESSARY FOR PRODUCTION PULTRUSION OF SANDWICH STRUCTURES, INCLUDING BEAMS, FOR USE IN COMPOSITE AIRFRAMES. PARAMETERS WILL BE GENERATED AND OPTIMIZED FOR PULTRUDING MILITARY QUALITY FLOORING.

(7373) TITLE - SAND PUNCH SP# OF TITANIUM

300 250

PROBLEM - MANY AIRFRAME PARTS CONSIST OF MULTIPLE DETAILS RIVETED OR SPOT-WELDED TOGETHER THAT INCREASE THE FORMING CYCLE, TOOLING COSTS, AND LABOR. ALSO MANY PART CONTOURS ARE IMPOSSIBLE TO FORM BY CONVENTIONAL METHODS.

SOLUTION - THIS PROJECT WILL DEVELOP A 'SAND PUNCH' METHOD OF SUPERPLASTICALLY FORMING TITANIUM ALLOYS AS A PRACTICAL, ECONOMICAL PRODUCTION METHOD.

(7374) TITLE - BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS

450 300

PROBLEM - RECENT ADVANCES IN THE DEVELOPMENT OF LASER WEAPONS HAVE REAPPRAISED THE TIMING FOR THE INTRODUCTION OF LASER TACTICAL WEAPONS.

SOLUTION - THIS PROJECT WILL DEVELOP THE MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION AND RETROFIT OF BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS. BI-MATRIX C-C IS A HIGH STRENGTH LIGHTWEIGHT INTEGRAL HIGH ENERGY LASER PROTECTIVE BARRIER SYSTEM.

(7389) TITLE - SUPERPLASTIC FORMING OF ALUMINIUM COMPONENTS

280 125 445

PROBLEM - CURRENT METHODS OF MACHINING ALUMINIUM FORGINGS ARE EXPENSIVE AND REQUIRE AN EXCESSIVE NUMBER OF PARTS.

SOLUTION - ESTABLISH FABRICATION TECHNOLOGY NECESSARY TO MANUFACTURE ALUMINUM AIRFRAME COMPONENTS THRU THE APPLICATION OF SUPERPLASTIC FORMING OF ALUM ALLOY SHEET MATERIAL.

MMT FIVE YEAR PLAN  
RCS DRLMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- STRUCTURAL MEMBERS

(CONTINUED)

(7414) TITLE - JOINING OF REIN THERMOPLASTIC COMPOSITE STRUCT

225

PROBLEM - UTILIZATION OF FIBER REINFORCED THERMOPLASTIC RESIN SYSTEMS TO FORM STRUCTURAL ELEMENTS CURRENTLY ARE JOINED BY ADHESIVE BONDING WHICH TAKES HOURS TO CURE.

SOLUTION - USE LOW COST DIRECT MATERIAL JOINING METHODS SUCH AS ULTRASONIC SEAM OR SPOT WELDING, DIRECT THERMAL FUSION, ETC FOR REINFORCED THERMOPLASTIC STRUCTURAL ELEMENTS.

(7436) TITLE - HIGH PERFORMANCE METAL MATRIX COMPOSITE STRINGER FORMS

250 350

PROBLEM - EPOXY MATRIX COMPOSITES FOR ADVANCED APPLICATIONS HAVE OUTSTANDING MECH PROPERTIES BUT LACK STABILITY IN HIGH TEMP/HUMIDITY ENVIRONMENTS. MANTECH FOR STRINGER FORMS HAS REACHED A MILESTONE ON PILOT SCALE BUT MUST BE SCALED TO AIRFRAME CONFIGURATION.

SOLUTION - DEVELOP PROCESS AND TOOLING FOR UNIDIRECTIONAL FORMS OF METAL MATRIX COMPOSITES. THE PROCESS IS CHARACTERIZED BY A SINGLE STEP MODE ACHIEVING CONSOLIDATION, HIGH PERF PROPERTIES, VARIOUS CROSS SECTION, PRECISE DIMENSIONS AND EXTENDED LENGTH.

COMPONENT --- STRUCTURAL PANELS

(7359) TITLE - POLYIMIDE FOAM FOR MULTIFUNCTIONAL AIRCRAFT STRUCT

175 175

PROBLEM - NUMEX/POLYIMIDE FOAM HAS BEEN DEVELOPED AS A STRUCTURAL CORE FOR MULTIFUNCTIONAL AIRCRAFT SANDWICH STRUCTURES. CHOPPED GLASS AND GRAPHITE ARE INCORPORATED INTO THE FOAM TO GIVE REQUIRED CHARACTERISTICS. PRODUCTION IS HIGH COST WITH LARGE VARIATIONS.

SOLUTION - AN AUTOMATED FOAM DISPENSING UNIT WILL BE COMBINED WITH HONEYCOMB FORMING AND SHAPING EQUIPMENT TO FORM CURVED OR COMPLEX SHAPED HONEYCOMB CORE WITH CURED POLYIMIDE FOAM IN PLACE. MICROWAVE, RF, OR FORCED AIR WILL BE USED FOR CURING.

(7395) TITLE - HAND HELD WATER JET CUTTING

150 100

PROBLEM - CONVENTIONAL METHODS OF CUTTING FLAT AND FORMED COMPOSITE AND NONMETALLIC PANELS RESULTS IN RAPID TOOL WEAR AND HIGH DUST LEVELS. WHEN USED ON KEVLAR FUZZING OF EDGES OCCURS RESULTING IN SECONDARY OPERATIONS.

SOLUTION - THIS PROJECT WILL DEVELOP A HAND HELD WATER JET CUTTER TO BE USED FOR CUTTING COMPOSITES.

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\*AVIONICS\*  
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FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- GENERAL

(7006) TITLE - MMT MAN TECHNOLOGY FOR AVIONICS

2100

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN THE AVIONICS AREA.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE NEW OR IMPROVED TECHNIQUES THAT WILL INCREASE RELIABILITY AND REDUCE LIFE CYCLE COSTS IN THE AVIONICS FIELD.

(7406) TITLE - REINFORCED THERMOPLASTIC CONTROLS

225

PROBLEM - CONVENTIONAL BELLCKRANKS ARE CAST WITH BEARINGS AND BUSHINGS INDIVIDUALLY DRILLED AND PRESSED IN. BEARING REPLACEMENT IS A TIME CONSUMING PROCESS AND INCURS THE RISK OF BEARING DAMAGE.

SOLUTION - DEVELOP THE PROPER COMBINATION OF MATERIALS AND PROCESSES TO PRODUCE LOW COST INJECTION MOLDED BELLCKRANKS HAVING BEARINGS MOLOED IN PLACE.

(7412) TITLE - INFRARED DETECTOR FOR LASER WARNING RECEIVER

750 250

PROBLEM - SUPPLY OF GALLIUM ARSENIIDE ETALONS FOR USE AS IR DETECTORS IS LIMITED. METHODS FOR DIFFUSING THE DETECTOR JUNCTION, FOR SURFACE PASSIVATION, FOR BONDING THE INTERDIGITATED ETALON TO THE INTERDIGITATED DETECTOR ARE LARGELY HAND METHODS.

SOLUTION - DEVELOP ALTERNATE SOURCES OF GA-AS MATERIAL, AND AUTOMATE METHODS FOR CONTROLLING JUNCTION DIFFUSION, FOR PASSIVATION, AND FOR BONDING LEADS TO THE DETECTOR ARRAY. BUILD SAMPLE DETECTORS.

(7418) TITLE - COMPOSITE ELECTRO-OPTICAL SYSTEM(EDS)

250 800 150

PROBLEM - MECHANICAL RIGIDITY, STABILITY, OVERALL WEIGHT, AND COSTS ARE PRINCIPLE AREAS AFFECTING THE UTILITY AND AFFORDABILITY OF SOPHISTICATED EDS'S.

SOLUTION - A COMPOSITE BASED EDS WILL BE FABRICATED UTILIZING THE RESULTS OBTAINED IN THE SLOS PROGRAM.

COMPONENT -- GUIDANCE SYSTEMS

(7383) TITLE - USE OF MOLDED PLASTIC HARDWARE IN TWO AXIS DRY GYROSCOPES

165 300

PROBLEM - THE PRIMARY COST DRIVER IN THE MANUFACTURE OF CURRENT INERTIAL GYROSCOPES IS THE MACHINING OF SMALL PRECISION COMPLEX METAL PARTS. THE MACHINED PARTS ARE HIGH COST AND ALSO REPRESENT PRODUCTION LEAD TIME PROBLEMS.

SOLUTION - MOLD THE GYROSCOPES FROM CARBON FIBER COMPOSITES.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- GUIDANCE SYSTEMS

(CONTINUED)

(7407) TITLE - AUTOMATED LASER SOLDERING

330

PROBLEM - CURRENT TECHNOLOGY UTILIZES REFLOW SOLDER AND WAVE SOLDER TECHNIQUES FOR PRINTED CIRCUIT BOARD ASSEMBLIES. THESE METHODS ARE HIGH COST AND BE UNRELIABLE.

SOLUTION - THIS PROBLEM WILL DEVELOP LASER SOLDERING TECHNIQUES FOR ATTACHING COMPONENTS AND INTEGRATED CIRCUITS TO PRINTED CIRCUIT BOARDS.

(7445) TITLE - DIGITAL/OPTICAL POSITION TRANSDUCERS

700 800

PROBLEM - IN ORDER TO PRODUCE THE DIGITAL/OPTICAL POSITION TRANSDUCERS ECONOMICALLY, WAYS OF MAKING THE FIBER OPTIC DELAY BOBBINS SHALL WITHOUT BREAKAGE DUE TO WINDING AND ENVIRONMENT ARE NEEDED. A FIBER MATERIAL NEEDS TO BE SELECTED FOR PERFORMANCE REQUIREMENT

SOLUTION - ESTABLISH THE REQUIRED METHODS AND USE THE PROPER MATERIALS TO MAKE THE TRANSDUCER MORE COMPETITIVE WITH ELECTROMECHANICAL TRANSDUCERS.

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\*DRIVE SYSTEM \*  
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COMPONENT --- BEARINGS

(7334) TITLE - ESTABLISH MANIECH FOR POWDER PROC ROLLING BEARINGS

190 140

PROBLEM - LIFE IMPROVEMENTS CONDUCTED ON POWDER PROCESSED AISI M50 STEEL HAVE BEEN OBSERVED WHEN COMPARED TO WROUGHT CONSUMABLE VACUUM ARC REMELTED (CVM) AISI M50 STEEL.

SOLUTION - DEVELOP ECONOMICALLY SOUND PRODUCTION PROCEDURES FOR QUALITY ASSURANCE OF THE POWDER, PRESSING AND SINTERING, AND SUBSEQUENT OPERATIONS TO MANUFACTURE FINISHED COMPONENTS. THE COMPONENTS WILL BE PRESSED TO NEAR NET SHAPE.

COMPONENT --- GEARS

(7003) TITLE - MANUFACTURING TECHNOLOGY FOR DRIVE PARTS AND COMP

1500 2705

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURE IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE METALLIC AND NON-METALLIC DRIVE PARTS FROM EXISTING OR NEW MATERIALS TO INCREASE RELIABILITY AND DECREASE LIFE CYCLE COSTS.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- GEARS

(CONTINUED)

(7155) TITLE -- COST EFFECTIVE MFG METHODS FOR HELICOPTER GEARS

PROBLEM -- DEMAND IN HELICOPTER OPERATION OF GREATER RELIABILITY OF HIGH PERFORMANCE GEARS AT LOWER COST HAS REQUIRED THAT IMPROVED PROCESSING AND EVALUATION TECHNIQUES BE INSTITUTED.

SOLUTION -- PROJECT WILL ADDRESS THE TOTAL GEAR MANUFACTURING PROCESS, INTEGRATING AVAILABLE NON-DESTRUCTIVE INSPECTION PROCEDURES AND REPLACING INDIVIDUAL TOOTH GRINDING WITH A COMBINATION OF AUSROLLING AND A FINAL ROTARY TOOTH FINISHING PROCEDURE.

(71B7) TITLE -- POWDER MET GEARS FOR GAS TURBINE ENGINES

PROBLEM -- PRODUCE GEARS FOR TURBINE ENGINES AT A LOWER COST.

SOLUTION -- DEVELOP THE MANUFACTURING AND QUALIFICATION FOR THE PRODUCTION OF LIGHTLY STRESSED, LOW TEMPERATURE POWDER METALLURGY GEARS FOR SELECTED NON-CRITICAL APPLICATIONS.

(71B9) TITLE -- POWDER METALLURGY GEARS FOR GAS TURBINE COMPONENTS

PROBLEM -- NEW HIGH TEMPERATURE GEAR MATERIALS NOW PLANNED FOR SERVICE IN HELICOPTOR DRIVE TRAINS ARE BECOMING INCREASINGLY DIFFICULT TO PROCESS DUE TO THEIR HIGHER ALLOY CONTENT. AS THE DIFFICULTY INCREASES, SO DOES THE COST.

SOLUTION -- POWDER METAL NEAR NET SHAPE PROCESSING COUPLED WITH ADVANCED SURFACE PROCESSING REPRESENTS THE BEST APPROACH FOR THESE MATERIALS. THIS PROJECT WILL ESTABLISH A FULL MANUFACTURING AND QUALITY ASSURANCE SEQUENCE.

(729B) TITLE -- EVALUATION OF HIGH TEMPERATURE CARBURIZING

PROBLEM -- GEAR CARBURIZING IS PRESENTLY CARRIED OUT WITH A RELATIVELY SLOW ENDOOTHERMIC PROCESS, TYPICALLY AT 1700 DEG F, WHICH REQUIRES SURFACE PROTECTION AGAINST DECARBURIZING DURING THE CYCLE OR A POST HEAT TREAT REMOVAL OF THE DECARBURIZED LAYER.

SOLUTION -- REDUCE PROCESSING TIME BY INCREASING THE OPERATING CAPACITY. ALSO INVESTIGATE VACUUM CARBURIZING AND HARDING OF VARIOUS GEAR CONFIGURATIONS IN ORDER TO PRODUCE A MORE UNIFORM CARBON PROFILE OF GEAR TEETH.

(7376) TITLE -- AUTO INSPECT AND PRECISION GRINDING OF SB GEARS

PROBLEM -- CURRENT MFG METHOD FOR SPIRAL BEVEL GEARS IS LABOR INTENSIVE REQUIRING CONTACT PATTERN CHECKS WITH EXPENSIVE MASTER MATING GEARS. THE PATTERN SHIFTS WITH A CHANGE IN TORQUE AND TEMPERATURE, AS A RESULT, THE TOOTH FORM EXPERIENCES GREAT STRESS.

SOLUTION -- DEVELOP AN AUTOMATED PROD PROCESS OF GRINDING SPIRAL BEVEL GEARS BY TAPE CONTROLLED MACHINES, BASED ON A COORDINATE SYS MADE POSSIBLE BY A PARTIAL NON-INVOLUTE TOOTH FORM.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- GEARS

(CONTINUED)

(7394) TITLE - DOUBLE HELICAL GEAR

PROBLEM - THE LIFE LIMITING FAILURE MODE OF AIRCRAFT GEARS IS GEAR TOOTH PITTING OR SPALLING. THE DOUBLE HELICAL GEAR PLANETARY SYSTEM WILL UPGRADE PERFORMANCE OF THE TRANSMISSION.

SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS TO PRODUCE THE ONE-PIECE DOUBLE-HELICAL GEAR PLANETARIES BY SHAPING, SHAVING, HARDENING, AND HONING TO REDUCE TRANSMISSION FAILURE RATES.

330 375

(7399) TITLE - CARPENTER EX-00053 GEAR STEEL

PROBLEM - THE CURRENT MOST COMMON CARBURIZING GEAR STEEL IS AMS 6265. IT IS USUALLY TEMPERED AT 300-350F AND IS NOT SUITABLE FOR HIGH HOT-HARDNESS APPLICATIONS.

SOLUTION - QUALIFY EX-00053 GEAR STEEL (20 PERCENT STRONGER IN BENDING FATIGUE STRENGTH) AS THE NEXT GENERATION CARBURIZING GEAR STEEL BY FABRICATING AND COMPARISON TESTING THE COMMON TYPES OF GEARS MADE ON EX-00053 AND AMS 6265.

150

(7405) TITLE - PLASMA NITRIDING OF HELICOPTER GEARS

PROBLEM - CONVENTIONAL AMMONIA GAS NITRIDING MUST BE PRECEDED BY EXTENSIVE CHEMICAL AND ABRASIVE CLEANING BEFORE EXPOSURE TO THE NITRIDING ATMOSPHERE BECAUSE THE CUTTING TOOL BURNISHED METAL SURFACES RESIST THE PENETRATION OF THE CASE HARDENING NITROGEN.

SOLUTION - DEVELOP A PLASMA NITRIDING PROCESS. THE PLASMA IDEALLY BLAST CLEANS THE SURFACE AND PROMPTLY SATURATES THE SURFACE WITH NITROGEN. THE NITROGEN THEN DIFFUSES INTO THE SURFACE.

350

(7455) TITLE - HIGH HOT HARDNESS GEAR STEEL PROCESSING REFINEMENT

PROBLEM - PROCESSING OF HIGH HOT HARDNESS GEAR STEELS INCLUDES DOUBLE VACUUM MELTING (DVM) TO ACHIEVE AEROSPACE QUALITY STOCK. DVM IS EXPENSIVE AND LEAVES RESIDUAL INCLUSIONS THAT CAN AFFECT SCRAP RATES AND GEAR LIFE.

SOLUTION - THIS PROJECT WILL APPLY COST EFFECTIVE ELECTROSLAG REMELTING OR ELECTRON BEAM MELTING TECHNIQUES TO REDUCE THE PROCESS COST OF HIGH HOT HARDNESS GEAR FORGINGS.

200 200

COMPONENT --- GENERAL

(7524) TITLE - FREEWHEEL SPRING CLUTCH MANUFACTURING PROCESS

PROBLEM - WITH THE HIGH OUTPUT SPEED OF TODAY'S ENGINES, THE NEED EXISTS FOR A COST EFFECTIVE FABRICATION PROCESS OF HIGH SPEED OVERRUNNING CLUTCHES TO BE USED IN HELICOPTER TRANSMISSIONS.

SOLUTION - DEVELOP A PROCESS TO PRODUCE HELICAL SPRINGS WITHOUT THE NEED OF "START-STOP" HOLES WHICH CREATE AN IMBALANCE AND STRESS CONCENTRATION UTILIZING METAL MACHINING PROCESSES.

250 250



FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT -- GENERAL

(7393) TITLE - PROD OF COMPOSITE PITCH HOUSING

150

COMPONENT -- SHAFTS

(7326) TITLE - ADAPT OF ELECTRON BEAM WELDING FOR REPAIR SHAFTS

350

PROBLEM - DURING OVERHAUL OF HELICOPTER TRANSMISSIONS THE PERCENTAGE OF PART REJECTION FOR SPLINE WEAR IS HIGH FOR GEARS WITH SPLINE INTEGRAL SHAFTS.

SOLUTION - ESTABLISH THE TOOLING AND INSPECTION PROCEDURES FOR ELECTRON BEAM (EB) WELDING OF COMPLEX GEAR SHAFT/SPLINE ELEMENTS. BY THIS METHOD THE MOST EXPENSIVE ELEMENT (THE GEAR) CAN BE SAVED BY A SINGLE LOW COST WELD OF A NEW SPLINE TO THE GEAR/SHAFT.

COMPONENT -- TRANSMISSION HOUSING

(7354) TITLE - INTEGRALLY STIFFENED HELICOPTER TRANS CASE

650 1500 1300

PROBLEM - THE LOW STIFFNESS OF THE CURRENT CH-47 CAST MAGNESIUM ALLOY TRANSMISSION CASE CAUSES EXCESSIVE GEAR WEAR, EXCESSIVE NOISE AND EXCESSIVE VIBRATION.

SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS FOR CASTING FIBER REINFORCED, INTEGRALLY STIFFENED CH-47 TRANSMISSION CASES.

(7378) TITLE - STAINLESS STEEL FABRICATED HOUSING

600 1280 1120

PROBLEM - HELICOPTER TRANSMISSION HOUSINGS ARE MADE FROM MAGNESIUM CASTINGS. THEY ARE COSTLY AND HAVE HIGH REPLACEMENT RATES AT OVERHAUL DUE TO CRACKS AND CORROSION.

SOLUTION - APPLY VARIOUS FABRICATION TECHNIQUES TO VARIOUS MATERIALS SUCH AS STAINLESS STEEL TO PRODUCE A LIGHTER WEIGHT, NON-CORROSIVE, AND LESS COSTLY HOUSING.

(7384) TITLE - COMPOSITE ENGINE GEARBOX

375 250 600

PROBLEM - CONVENTIONAL GEAR HOUSINGS CONSISTING OF MAGNESIUM EXHIBIT LOW MODULUS, LOW FATIGUE STRENGTH, AND SUSCEPTIBILITY TO CORROSION.

SOLUTION - ESTABLISH A COST EFFECTIVE FILAMENT WINDING MANUFACTURING METHOD FOR A GRAPHITE FIBER/HIGH TEMPERATURE RESIN COMPOSITE HOUSING.

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\*FACTORY MODERNIZATION \*  
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FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- MISCELLANEOUS

(7426) TITLE - AIRCRAFT ELECTRONICS MFG PRODUCTIVITY IMPROVEMENT PROGRAM

110 2500 3000 2000

PROBLEM - ELECTRONICS MANUFACTURING FACILITIES ARE IN NEED OF MODERNIZATION. AGING FACILITIES, TECHNOLOGY, AND METHODS HAVE RESULTED IN HIGH MANUFACTURING COSTS AND SLOW DELIVERIES.

SOLUTION - ANALYZE THE MANUFACTURING FACILITIES OF A SELECTED CONTRACTOR (MARTIN MARIETTA) WITH FOCUS ON PRODUCTIVITY, AUTOMATION, COST SAVINGS, AND PLANT MODERNIZATION.

(7427) TITLE - ATTACK HELICOPTER PRODUCTIVITY IMPROVEMENT (API) PROGRAM

3000 3500 3000

PROBLEM - THE MANUFACTURING FACILITIES, METHODS, AND PRODUCTION MANAGEMENT SYSTEMS OF PRIME CONTRACTORS ARE NOT IN THE LATEST STATE-OF-THE-ART CONDITION. THIS RESULTS IN HIGH COST AND LATE DELIVERY.

SOLUTION - CONTRACTORS FACILITY WILL BE EVALUATED, AND WILL RESULT IN AN INCENTIVE CONTRACTUAL PLAN FOR PLANT MODERNIZATION AND AUTOMATION, COMPUTERIZATION, IMPROVED PRODUCTION PLANNING, CONTROL, HANDLING AND INVENTORY, AND ESTABLISH MIS SYSTEMS.

(7428) TITLE - IPI PROGRAM - AVCO LYCOMING - TURBINE ENGINES

2500 3000 2000

PROBLEM - THE FACILITIES, METHODS, AND MANAGEMENT SYSTEMS OF AVCO LYCOMING ARE OUTDATED. THIS RESULTS IN ELEVATED COST, LOW PRODUCTIVITY, LATE DELIVERY AND REDUCED CAPACITY.

SOLUTION - THE ENTIRE MANUFACTURING ENVIRONMENT WILL BE STUDIED AND PROBLEM AREAS IDENTIFIED. STATE-OF-THE-ART SYSTEMS, FACILITIES AND METHODS WILL BE DESIGNED AND IMPLEMENTED.

(7429) TITLE - IPI PROGRAM - SIKORSKY AIRCRAFT - UH-60 BLACKHAWK

2500 3000 2000

PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS OF SIKORSKY ARE NOT IN THE LATEST STATE-OF-THE-ART CONDITION. THIS RESULTS IN HIGH MANUFACTURING COST, LOWER PRODUCTIVITY AND SLOW DELIVERY.

SOLUTION - AN INCENTIVE CONTRACTUAL PLAN WILL BE ARRANGED TO HELP THE CONTRACTOR INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO MODERNIZE AND AUTOMATE THE PRODUCTION FACILITIES AND IMPROVE MANAGEMENT SYSTEMS.

(7433) TITLE - IPI PROGRAM - BELL HELICOPTER TEXTRON INC - AHIP

2000 3000 2000

PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT BELL HELICOPTER TEXTRON, INC ARE NOT UP TO THE LEVEL IN THE GENERAL AEROSPACE INDUSTRY. THIS RESULTS IN HIGH COST AND SLOW DELIVERY.

SOLUTION - AN INCENTIVE CONTRACTUAL PLAN WILL BE ARRANGED TO HELP BELL INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.

FUNDING (\$DDDD)

PRIOR 82 83 84 85 86

COMPONENT --- MISCELLANEOUS

(CONTINUED)

(7442) TITLE - IPI PROGRAM - BUEING VERTOL INC - CH-47D HELICOPTER

PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT BOEING VERTOL, INC. ARE NOT UP TO THE LEVEL IN THE GENERAL AEROSPACE INDUSTRY. THIS RESULTS IN HIGH COST AND SLOW DELIVERY.

SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP BOEING INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.

(7449) TITLE - IPI PROGRAM - LOCKHEED MISSILES + SPACE CO -RPV

PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT LOCKHEED MISSILES AND SPACE CO. ARE NOT UP TO THE STATE-OF-THE-ART LEVEL IN INDUSTRY. THIS WILL RESULT IN HIGHER COSTS AND SLOW DELIVERY.

SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP LOCKHEED, SUNNYVALE, CA, INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.

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\*GENERAL\*  
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COMPONENT --- ALL

(7362) TITLE - ENG DESIGN HANDBOOK FOR TITANIUM CASTINGS

PROBLEM - NO PROVISION HAS BEEN MADE FOR COLLECTING INFORMATION FROM THE ADVANCING STATE OF THE ART IN CAST TITANIUM ALLOYS.

SOLUTION - THIS PROJECT WOULD COLLECT INFORMATION FROM PAST AND ONGOING PROJECTS DEALING WITH HIGH QUALITY TITANIUM CASTINGS, CREATE NEW DATA TO FILL TECHNICAL GAPS, AS REQUIRED, AND GENERATE AN ENGINEERING DESIGN HANDBOOK.

(7443) TITLE - ROBOTICS FOR HIGH PRODUCTIVITY FORGINGS

PROBLEM - THE NEED FOR INCREASED PRODUCTIVITY COUPLED WITH DECREASED FUNDING DICTATES THAT CURRENT TECHNOLOGY, SUCH AS ROBOTICS, MUST BE UTILIZED FULLY EFFECTIVELY IN THE MANUFACTURING PROCESS. AS FORGING CAPACITY DECREASES PRODUCERS NEED TO IMPROVE METHODS.

SOLUTION - AN ADVANCE SYSTEM WOULD INCLUDE A ROBOT, AN IMAGE SENSING AND THERMAL VIEDO SUB-SYSTEM GATHERING AND PROVIDING INFORMATION TO A MINI-COMPUTER. THIS DATA WOULD BE USED TO CONTROL FORM + HEATING OF THE WORK-PIECE.

2000 3000 2000

2500 3000 2000

150

225 140 140

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- SAFETY

(7022) TITLE - PDN OF POLYPHOSPHAZENE FIRE RESIST HYDRAULIC FLUIDS

220

PROBLEM - CURRENT HYDRAULIC FLUIDS THAT MEET REQUIRED PERFORMANCE SPECIFICATIONS ARE FLAMMABLE.

SOLUTION - THE DEVELOPMENT OF PHOSPHAZENE FLUIDS DEMONSTRATE THERMAL STABILITY, VISCO-ELASTIC PROPERTIES, AND FIRE RESISTANCE. THIS WOULD INCREASE THE FIRE SAFETY OF ARMY AIRCRAFT.

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\* C A T E G O R Y \*  
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\* ROTOR SYSTEM \*  
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COMPONENT -- BLADE

(7322) TITLE - RADIATION CURE OF ROTOR BLADES

150 150

PROBLEM - BLADE COATINGS ARE BUILT UP IN MULTI-LAYERS EACH LAYER REQUIRING SOLVENT FLASH-OFF TIME. MAIN ROTOR-BLADES CAN CONSUME UP TO 10 MANHOURS FOR COATING OPERATIONS.

SOLUTION - THIS PROGRAM WOULD PROVIDE THE RADIATION CURABLE COATINGS FORMULATION TEST DATA, ECONOMIC JUSTIFICATION STUDIES AND FACILITY DESIGN CRITERIA FOR THE RADIATION CURE OF ROTOR BLADE COATINGS.

(7403) TITLE - ELECTRONIC BLADE BALANCE SYSTEM

275 250

PROBLEM - THE STATIC BALANCING OF ROTOR BLADES USING CURRENT METHODS RESULTS IN A SIGNIFICANT DIRECT LABOR AND ELAPSED TIME EXPENDITURE.

SOLUTION - DEVELOP A COMPUTER ASSISTED BLADE BALANCE MACHINE WHICH DETERMINES THE AMOUNT AND LOCATION OF CORRECTIVE BALANCE WEIGHT ADDITIONS.

(7404) TITLE - AUTOMATED CURE CYCLES

275

PROBLEM - PRESENT CURING PROCESSES ARE BASED ON THE PREPREG MANUFACTURE?S RECOMMENDED CURE CYCLE DEPENDENT ON A FIXED SCHEDULE OF TEMP AND PRESS VS TIME. THIS IS IMPRACTICAL IN A PRODUCTION ENVIRONMENT.

SOLUTION - DEVELOP A SYSTEM FOR ELECTRONICALLY MONITORING THE CURE OF ORGANIC LAMINATING RESIN SYSTEMS USING THE CURE AND PRESSURE CONTROL SYSTEM OF THE CURING EQUIPMENT.

FUNDING (\$000)

PRIOR	82	83	84	85	86

COMPONENT -- BLADE/COMPOSITE STRUCTURES

(7339) TITLE - COMPOSITE TAIL ROTOR BLADE

PROBLEM - FILAMENT WINDING FROM A SOLID FLEXBEAM TO AN OPEN SPAR SECTION, WINDING TO NET SHAPE, IMPROVED RESIN CONTROL AND TOLERANCE CONTROL MUST BE OBTAINED TO ENHANCE THE COST EFFECTIVENESS OF FLEXBEAM TAIL ROTORS.

SOLUTION - TECHNIQUES WILL BE DEVELOPED FOR CONTINUOUS FILAMENT WINDING FROM OPEN TO CLOSED SECTIONS, WINDING NET CONTOUR SHAPE, OPTIMIZING TOLERANCE CONTROL WITH IMPROVED TOOLING, AND IMPROVED RESIN CONTROL TO ENSURE MINIMUM WEIGHT COMPONENTS.

(7340) TITLE - COMPOSITE MAIN ROTOR BLADE

PROBLEM - CURRENT PRODUCTION COMPOSITE BLADE PROGRAMS HAVE NOT BEEN ORIENTED TOWARD OPTIMIZING MANUFACTURING TECHNIQUES/PROCESSES RELATED TO BLADE CONFIGURATIONS, FABRICATION METHODS, AND IMPROVED STRUCTURAL RELIABILITY.

SOLUTION - IMPROVED METHODS WILL INCLUDE SOFT INFLATABLE MANDRELS, INCREASE IN FIBER BAND WIDTH, IMPROVED MATRIX CONTROL PROCEDURES, BALANCED SHELL TOOLING, AND NET SHAPE WINDING.

(7382) TITLE - LOW COST COMPOSITE MAIN ROTOR BLADE FOR THE UH-60A

PROBLEM - MANUFACTURING TECHNOLOGY FOR COCURING GLASS AND GRAPHITE FILAMENT WOUND MAIN ROTOR BLADES HAS NOT BEEN ESTABLISHED FOR THE PRODUCTION ENVIRONMENT.

SOLUTION - DEVELOP FILAMENT WINDING TECHNOLOGY FOR FABRICATING D SPARS THROUGH OPTIMIZED WINDING OF WET FILAMENTS.

(7388) TITLE - MANUFACTURING PROOF TESTING OF COMPOSITE ROTOR BLADES

PROBLEM - THERE IS A LACK OF A TECHNIQUE WHICH CAN ADEQUATELY DETERMINE STRUCTURAL INTEGRITY OF COMPOSITE MAIN ROTOR BLADES AT THE CONCLUSION OF THE FABRICATION CYCLE.

SOLUTION - ESTABLISH AN ACOUSTIC EMISSION TECHNIQUE FOR PROOF TESTING COMPOSITE ROTOR BLADES.

COMPONENT -- BLADE/SPAR

(7360) TITLE - EXTRUSION OF PRECISION HOLLOW AIRCRAFT COMPONENTS

PROBLEM - SOME HOLLOW COMPONENTS, SUCH AS TITANIUM BLADE SPARS, ARE MANUFACTURED FROM SHEET BY WELDING A TUBE AND HOT FORMING. THIS IS A VERY EXPENSIVE TECHNIQUE.

SOLUTION - CAD/CAM TECHNIQUES, RECENTLY DEVELOPED FOR EXTRUSION OF SOLID SHAPES, CAN BE APPLIED TO HOLLOWs TO IMPROVE EXTRUSION TOLERANCES AND REDUCE MANUFACTURING COSTS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- HUB

(7241) TITLE - HOT ISOSTATICALLY PRESSED TITANIUM CASTINGS

736 500

PROBLEM - THE CURRENT METHOD OF MANUFACTURING ROTOR HUBS RESULTS IN EXCESSIVE USE OF MATERIALS AND MACHINING. PROJECT FOR FABRICATION OF A COMPOSITE MAIN ROTOR HUB HAS BEEN CANCELLED. THE CURRENT FORGED HUB IS A LONG-LEAD TIME ITEM.

SOLUTION - ESTABLISH THE MANUFACTURING PROCESS FOR HOT ISOSTATIC PRESSING (HIP) OF A CAST BLACKHAWK TITANIUM ROTOR HUB. THE REQUIRED MATERIAL PROPERTIES ARE ATTAINABLE AND A COST SAVINGS OF 36 PERCENT IS EXPECTED.

(8139) TITLE - COMPOSITE MAIN ROTOR HUB

225 750 650

PROBLEM - UNACCEPTABLE SIZE AND WEIGHT PENALTIES ARE INCURRED WHEN CONVENTIONAL METALLIC MATERIALS ARE USED FOR ADVANCED HUB DESIGNS.

SOLUTION - DEVELOP THE FABRICATION TECHNOLOGY, TOOLING AND AUTOMATED TECHNIQUES NECESSARY TO MANUFACTURE COMPOSITE ROTOR HUBS.

COMPONENT --- MISC COMPONENTS

(7004) TITLE - MFG TECHNOLOGY FOR ROTOR ITEMS AND ASSOCIATE COMPS

850 2920

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MFG ROTOR ITEMS AND ASSOCIATED COMPONENTS FROM EXISTING OR NEW MATERIALS THAT WILL INCREASE RELIABILITY AND REDUCE LIFE CYCLE COSTS.

(7119) TITLE - NON-DESTRUCTIVE EVAL TECHNIQUES FOR COMPOSITE STRUCTURES

1231 500

PROBLEM - IMPLEMENTATION OF COMPOSITE STRUCTURES IN THE ARMY AIRCRAFT IS DEPENDANT UPON THE ABILITY TO DETECT AND EVALUATE DEFECTS.

SOLUTION - ESTABLISH A VIABLE AND COMPREHENSIVE IN-PROCESS INSPECTION PROGRAM FOR NON-DESTRUCTIVE INSPECTION OF COMPOSITE STRUCTURES.

(7345) TITLE - IN-PROCESS CONTROL OF RESIN MATRIX CURE

300 275

PROBLEM - CONVENTIONAL CONTROL OF THE CURE STAGE DURING COMPOSITE HARDWARE MANUFACTURING IS ATTAINED THROUGH MANUAL OR AUTOMATIC CONTROL OF THE AUTOCLAVE/PRESS TEMPERATURE AS A FUNCTION OF TIME. THIS METHOD IGNORES THE CHEMICAL STATE OF THE RESIN DURING CURE.

SOLUTION - USE IN-PROCESS CONTROL TECHNIQUES CAPABLE OF MONITORING THE RESIN FLOW/CURE BEHAVIOR TO INSURE PRODUCTION OF COMPONENTS HAVING CONSISTENTLY HIGH QUALITY.



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 \* C A T E G O R Y \*  
 \*-----\*  
 \*TURBINE ENGINE\*  
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MMT FIVE YEAR PLAN  
 RCS DRCHT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- CERAMIC COMPONENTS

(735D) TITLE - CERAMIC COMPONENTS FOR TURBINE ENGINES

1650 2660 3070

PROBLEM - METAL BLADES/VANES FOR TURBINE ENGINES ARE HIGH COST, USE CRITICAL MATERIALS, AND HAVE UNACCEPTABLE TEMPERATURE LIMITATIONS. CERAMIC MATERIALS WHICH HAVE BETTER PROPERTIES ARE NOT USED BECAUSE OF NON-REPRODUCIBLE PROPERTIES AND SHAPE LIMITATIONS.

SOLUTION - SILICON NITRIDE FORMED BY INJECTION MOLDING AND REACTION BONDING IS SUITABLE FOR VANES, AND SILICON CARBIDE FORMED BY INJECTION MOLDING AND PRESSURELESS SINTERING HAS TEMPERATURE AND PRESSURE CHARACTERISTICS SUITABLE FOR BLADES.

COMPONENT --- COMBUSTOR

(7322) TITLE - LOW COST TRANSPIRATION COOLED COMBUSTOR LINER

125 530

PROBLEM - COMBUSTOR LINERS OF ADVANCED GAS TURBINE ENGINES ARE REQUIRED TO SURVIVE USING LESS COOLING AIRFLOW THAN HERETOFORE AVAILABLE. STATE OF THE ART TRANSPIRATION COOLED LINERS CAN MEET THE REQUIREMENTS BUT MANUFACTURING PROCESSES ARE NOT COST EFFECTIVE.

SOLUTION - REFINE A LOW-COST MANUFACTURING TECHNIQUE TO FORM THE NECESSARY COMPLEX SHAPES AND COOLING PASSAGES. PROCESS WILL BE USABLE WITH COMMON COMBUSTOR LINER ALLOYS TO BE CONSISTENT WITH THE LOW-COST CONCEPT BEING PURSUED. JOINING WILL ALSO BE REFINED.

(7377) TITLE - SPF/DB STATIC STRUCTURE FOR TURBINE ENGINES

475 675 100

PROBLEM - TITANIUM STATIC COMPONENTS OF TURBINE ENGINES USE FORGINGS OR CASTINGS WELDED TO SHEET STOCK AND MACHINED ALL OVER. THIS PROCESS IS TOO COSTLY AND HAS POOR UTILIZATION OF CRITICAL MATERIAL.

SOLUTION - ADAPT THE SPF/DB TECHNOLOGY TO THE MANUFACTURE OF A TITANIUM STATIC COMPONENT OF A TURBINE ENGINE.

COMPONENT --- COMPRESSOR

(7143) TITLE - MFG OF SPRAY ABRADABLE GAS PATH SEAL SYSTEM

280 455

PROBLEM - METALLIC SYSTEMS CURRENTLY USED IN HIGH PRESSURE TURBINE SEALS DEGRADE DUE TO EROSION, CORROSION, AND ADVERSE RUB BEHAVIOR RESULTING IN INCREASED CLEARANCES OVER THE TURBINE BLADE TIPS AND LOSS OF ENGINE PERFORMANCE.

SOLUTION - EXTENSIVE R+D WORK HAS BEEN PERFORMED UNDER NASA, ARMY, + NAVY CONTRACTS, AND IR+D TO DEVELOP VARIOUS CERAMIC SEAL MATERIAL SYSTEMS. MANUFACTURING PROCESS PARAMETERS WILL BE ESTABLISHED FOR PLASMA-SPRAYED ZIRCONIUM OXIDE SEAL COMPONENTS.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- COMPRESSOR

(CONTINUED)

(7285) TITLE - CAST TITANIUM IMPELLER FOR TURBINE ENGINE

914 350

PROBLEM - CURRENT CENTRIFUGAL COMPRESSOR IMPELLERS ARE FABRICATED BY MACHINING THE FLOWPATH AND BLADE SURFACES FROM A FORGING. THIS RESULTS IN A SUBSTANTIAL LOSS OF MATERIAL AND EXPENSIVE MACHINING OPERATIONS.

SOLUTION - ESTABLISH THE FABRICATION OF TITANIUM COMPRESSOR IMPELLERS BY CASTING AND HOT-ISOSTATIC PRESSING (HIP). THIS METHOD WILL REDUCE FABRICATION COSTS BY 40 PERCENT. IR&D CONDUCTED BY GAS TURBINE ENGINE MANUFACTURERS HAS DEMONSTRATED FEASIBILITY.

(7291) TITLE - TITANIUM POWDER METAL COMPRESSOR IMPELLER

570 275

PROBLEM - WHEN COMPLEX CONFIGURATIONS, SUCH AS CENTRIFUGAL IMPELLERS AND COMPRESSOR ROTORS ARE UTILIZED IN GAS TURBINE ENGINES, TYPICALLY HIGH MANUFACTURING COST ARE ENCOUNTERED.

SOLUTION - DEVELOP OVERALL PROCESS CONTROLS CAPABLE OF REPRODUCIBLY PRODUCING 100 % DENSE PARTS WITH TENSILE, AND FATIGUE STRENGTHS EQUAL TO THOSE OF HIGH QUALITY TITANIUM FORGINGS.

(7415) TITLE - RECOVERING DAMAGED T700 COMPRESSOR BLISKS

300 400 200

PROBLEM - BLISKS (INTEGRAL BLADES AND DISKS) ARE USED IN THE T700 ENGINE COMPRESSOR STAGES 1 THRU 5. DAMAGE TO ANY ONE BLADE DURING MANUFACTURING OR IN THE FIELD RESULTS IN SCRAPPING THE WHOLE BLISK.

SOLUTION - USE OF PRESSURE BONDING TO REPLACE DAMAGED AIRFOILS PROVIDES PROPERTIES EQUAL TO THE PARENT METAL. HIGH FREQUENCY INDUCTION HEATING WITH SIMULTANEOUS APPLICATION OF PRESSURE HAS BEEN DEMONSTRATED TO BE FEASIBLE FOR BLISK APPLICATION.

(7434) TITLE - INJECTION FORGING OF TITANIUM IMPELLERS

235 265

PROBLEM - AIRCRAFT QUALITY IMPELLERS FOR AUXILIARY POWER UNITS AND MAIN POWER PLANTS ARE PRESENTLY BEING FABRICATED FROM TITANIUM FORGINGS BY LABOR INTENSIVE AND COSTLY OPERATIONS.

SOLUTION - ESTABLISH AN INJECTION FORGING PROCESS TO PRODUCE A NEAR NET SHAPE FORGING. THIS PROCESS HAS BEEN USED SUCCESSFULLY TO FORGE COMPRESSOR BLADE ROOTS IN TITANIUM, STEEL AND SUPERALLOYS.

COMPONENT -- COMPRESSOR/TURBINE DISK

(7457) TITLE - APPLICATION OF FINE GRAINED PREFORMS

PROBLEM - INGOT METALLURGY RESULTS IN LARGE GRAIN SIZES AND SEGREGATION/MICROSTRUCTURAL EFFECTS THAT YIELD POOR METAL FLOW AND EXPENSIVE LOW LIFE TOOLING.

SOLUTION - ESTABLISH THE PROCESSES FOR GAS TURBINE COMPONENTS FROM FINE-GRAIN INGOT TECHNOLOGY. ISOTHERMAL FORGING TECHNIQUES WILL PRODUCE A FINE-GRAINED, LOW FLOW STRESS PREFORM WITHOUT THE USE OF A POWDER METALLURGY STEP.

400 500

COMPONENT -- GENERAL

(7002) TITLE - MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE EXISTING OR ANTICIPATED HI-PERFORMANCE ENGINE AND ASSOCIATED COMPONENTS USING CURRENT OR NEW MATERIALS.

2600 3800

(7248) TITLE - CLOSED LOOP MACHINING, MID-FRAME

PROBLEM - THE ENGINE MID-FRAME HAS 22 DIAMETERS WITH TOLERANCES RANGING FROM .001 IN. THESE TOLERANCES RESULT IN HIGH MACHINING, REMARK AND INSPECTION COSTS.

SOLUTION - DEVELOP CLOSED LOOP MACHINING THAT WILL AUTOMATICALLY COMPENSATE FOR ANY DEVIATION IN NUMERICAL CONTROLLED PROGRAMMED PLAN THEREBY REDUCING PRODUCTION COSTS.

540 420

(7435) TITLE - IRON BASE ALLOYS BY A RAPID SOLIDIFICATION PROCESS

PROBLEM - THE NEED FOR INCREASED PERFORMANCE CAPABILITY OF CURRENT AND NEW TURBINE SYSTEMS DICTATES THAT HIGH TEMPERATURE MATERIALS BE AVAILABLE FOR USE IN COMPONENTS.

SOLUTION - NEW RAPIDLY SOLIDIFIED IRON-BASE ALLOYS ARE BEING DEVELOPED THAT OFFER IMPROVED PERFORMANCE, LOWER COST AND REDUCED USE OF STRATEGIC MATLS. THIS PROJECT WILL QUALIFY THE PROCESSING TECHNOLOGY AND DEMONSTRATE COST AND PERFORMANCE BENEFITS.

500 800

COMPONENT -- SEALS

(7366) TITLE - SPIRAL SELF-ACTING SEAL

PROBLEM - LABYRINTH SEALS HAVE HIGH LEAKAGE RATES AND CAUSE SIGNIFICANT POWER LOSS. T700 DATA SHOW ENGINE POWER LOSSES OF 2-17 PCT DUE TO THE SEAL LEAKAGE. ACCURACY OF GROOVES AND PARALLELISM OF FACES NEED TO BE DEVELOPED.

SOLUTION - DEVELOP NEW TECH NECESSARY FOR FABRICATION OF SPIRAL GROOVE SELF ACTING SEALS. R&D HAS DEMONSTRATED THE HIGH-SPEED, LOW-WEAR, AND LOW-LEAKAGE CAPABILITY OF THE SPIRAL SEAL.

520

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- SEALS

(CONTINUED)

(67410) TITLE - SMALL ENGINE TURBINE SEAL OPTIMIZATION

330 250

PROBLEM - EFFICIENCIES OF SMALL GAS TURBINES ARE EXTREMELY SENSITIVE TO OPERATING CLEARANCES BETWEEN COMPRESSOR AND BLADE TIPS AND THE STATIONARY SEAL COMPONENTS.

SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZING A DUAL DENSITY PLASMA-SPRAYED CERAMIC SEAL. THE CHEMISTRY OF THE COATING WILL BE OPTIMIZED ALONG WITH THE POWDER MANUFACTURING PROCESS.

COMPONENT --- TURBINE BLADES

(67356) TITLE - COATINGS FOR UPGRADING PERF. OF GAS TURBINE ALLOYS

115 125

PROBLEM - THERMAL EXPANSION COEFFICIENT MISMATCH BETWEEN THE BOND AND CERAMIC LAYER RESULTS IN THERMAL STRESS CRACKING WITH SUBSEQUENT SPALLING WITHIN THE CERAMIC OVERLAY. R&D BY PRIVATE INDUSTRY HAS SHOWN THE FEASIBILITY OF THERMAL BARRIER CERAMIC OVERLAYS.

SOLUTION - ESTABLISH MANUFACTURING TECHNOLOGY FOR PRODUCING IMPROVED COATINGS ON NICKEL BASED SUPERALLOYS. PLASMA SPRAYED TECHNIQUES WILL BE UTILIZED TO OPTIMIZE A NI-CR-AL-TI CERAMIC THERMAL BARRIER OVERLAY BY ADDING AN INTERMEDIATE LAYER IN THE BLADES.

(67371) TITLE - INTEGRATED BLADE INSPECTION SYSTEM (IBIS)

670 500 460

PROBLEM - INSPECTION OF TURBINE ENGINE BLADES AND VANES NECESSITATES HIGH ACCURACY. THE EFFORT IS TIME CONSUMING AND SUSCEPTABLE TO ERROR.

SOLUTION - THIS PROJECT WILL IMPROVE THE INFRARED, X-RAY, AND INFRARED THERMOGRAPHY INSPECTION MODULES BY INCREASING RELIABILITY, REPEATABILITY AND SENSITIVITY. ALSO, INSPECTION COSTS WILL BE REDUCED.

(67416) TITLE - ADVANCED TURBINE AIRFOIL CASTINGS

400 500 200

PROBLEM - TURBINE AIRFOILS ARE DESIGNED TO A STRESS RUPTURE LIMIT WHETHER COOLED OR UNCOOLED. THIS LIMIT IS LOW DUE TO EQUIAXED CAST SUPERALLOY MATERIALS CURRENTLY USED AND THEIR INHERENT GRAIN BOUNDARY LIMITATIONS.

SOLUTION - ADVANCED CASTING TECHNIQUES PERMITTING DIRECTIONALLY-ALIGNED GRAIN GROWTH ELIMINATE THE GRAIN BOUNDARIES PERPENDICULAR TO THE STRESSED DIRECTION WHICH INCREASES THE LONGITUDE STRENGTH, CREEP RESISTANCE, AND RUPTURE LIMITS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- TURBINE DISKS

(7361) TITLE - COMPUTER AIDED HIP OF ENGINE DISKS

PROBLEM - MOST ENGINE DISKS ARE PRODUCED FROM TITANIUM AND SUPERALLOYS BY FORGING AND MACHINING AT CONSIDERABLE COST. HOT ISOSTATIC PRESSING (HIP) IS AN APPLICABLE NEAR NET SHAPE PROCESS BUT IT REQUIRES EXPENSIVE TRIAL AND ERROR RUNS FOR THE PREFORMS.

SOLUTION - A COMPUTER-AIDED DESIGN TECHNIQUE WILL BE DEVELOPED FOR ACCURATE DESIGN OF HIP PREFORMS. THIS TECHNIQUE WILL SIMULATE THE SIMULTANEOUS DENSIFICATION AND HEAT TRANSFER DURING A HIP CYCLE. RECENT WORK HAS SHOWN THE FEASIBILITY OF THIS APPROACH.

(7417) TITLE - LOW COST DISKS BY CAP

PROBLEM - POWDER METAL DISKS FORM A SIGNIFICANT PART OF THE ENGINE COST DUE TO EXPENSIVE TOOLING/DIE REQUIREMENTS AND HIGH PRESSURE CONSOLIDATION EXPENSE.

SOLUTION - RECENT DEVELOPMENTS IN CONSOLIDATION BY ATMOSPHERIC PRESSURE HAS SHOWN THAT SUPERALLOY POWDERS CAN BE CONSOLIDATED TO 98 PERCENT DENSITY AT A REDUCED COST. LOWER COST GLASS DIES CAN ALSO BE USED WHICH REDUCES THE COST FURTHER.

(7453) TITLE - CERAMIC-FREE ATOMIZATION OF SUPERALLOY POWDER

PROBLEM - CERAMIC CONTENT IN SUPERALLOY POWDERS USED FOR TURBINE COMPONENTS LIMITS THE BENEFITS OF POWDER METALLURGY. GAS ATOMIZATION REPRESENTS A HIGH VOLUME, LOW COST APPROACH BUT IT HAS NOT PREVENTED CERAMIC ADDITIONS TO THE POWDER.

SOLUTION - THIS PROJECT WILL EVALUATE SUPERALLOY ATOMIZATION TECHNIQUES, DEMONSTRATE QUANTIFIABLE CERAMIC REDUCTIONS AND IMPROVE GAS TURBINE ENGINE COMPONENT COST AND MATERIAL PERFORMANCE.

COMPONENT -- TURBINE ROTORS

(7191) TITLE - COST EFFECTIVE PRODUCTION OF COOLED TURBINE ROTORS

PROBLEM - PRODUCTION PROCESSES AND QUALITY CONTROL PROCEDURES DO NOT CURRENTLY EXIST FOR AIR-COOLED TURBINE ROTORS.

SOLUTION - DEVELOP A COST EFFECTIVE PROCEDURE FOR PRODUCING AND ASSURING THE QUALITY OF SINGLE AIR-COOLED ROTORS WHICH CAN DO THE WORK OF TWO STAGES UNDER PRESENT TECHNOLOGY.

325 300

400 450 200

500 550

440

FUNDING (\$000)

PRIOR	82	83	84	85	86
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COMPONENT -- TURBINE ROTORS

(CONTINUED)

(7197) TITLE - FABRICATION OF INTEGRAL ROTORS BY JOINING

69D 217

PROBLEM - CURRENT GAS TURBINE ROTORS ARE EITHER INTEGRALLY CAST OR THE BLADES AND DISKS ARE SEPARATE UNITS. THE BLISK CONCEPT DOES NOT PERMIT OPTIMUM MECHANICAL PROPERTIES OF THE UNIT AND THE OTHER METHOD REQUIRES COMPLEX AND EXPENSIVE MACHINING.

SOLUTION - A BONDED BLADE AND DISK IS FEASIBLE AND WILL REDUCE THE MAJOR MACHINING REQUIREMENTS, STRESS CONCENTRATIONS, AND SIZE AND WEIGHT CONSTRAINTS ON THE DESIGN. THIS ALSO ALLOWS MATERIAL SELECTION TO BE BASED ON PERFORMANCE RATHER THAN JOINING CAPACITY.

(7300) TITLE - IMPROVED LOW CYCLE FATIGUE CAST ROTORS

135 48D 35D

PROBLEM - INTEGRALLY CAST TURBINE ENGINE ROTORS HAVE BEEN SHOWN TO BE COST EFFECTIVE. HOWEVER, INVESTMENT CASTING RESULTS IN LARGE GRAIN SIZES IN THE DISK REGION AND THIS REDUCES FATIGUE LIFE COMPARED TO WROUGHT MATERIAL.

SOLUTION - DEFINE CASTING AND HEAT TREAT PARAMETERS, AND FINALIZE THE MANUFACTURING TECHNOLOGY FOR ESTABLISHING FINE-GRAINED CAST ROTOR PRODUCTION UTILIZING GRAIN-REFINEMENT TECHNIQUES.

(7351) TITLE - COMPOSITE SHAFTING FOR TURBINE ENGINES

30D 325

PROBLEM - CURRENT MATERIAL CAPABILITIES ASSOCIATED WITH HIGH SPEED GAS TURBINE ENGINE SHAFTING REQUIRE EXCESS BEARINGS AND CAREFUL DESIGN REGARDING SHAFT DYNAMICS.

SOLUTION - RECENT DEVELOPMENTS IN FABRICATING METAL MATRIX COMPOSITE SHAFTING OFFER INCREASED STIFFNESS AND CRITICAL SPEEDS BY 30-40 PERCENT AND CAN REDUCE THE DIAMETER.

(7401) TITLE - CAST IMPELLER AND CLEAN CASTING

685 525

PROBLEM - INVESTMENT CAST METAL HAS NUMEROUS SOURCES OF NON-METALLIC CONTAMINATION DURING CONVENTIONAL PROCESSING. THE RESULTING INCLUSIONS REDUCE CASTING PROPERTIES OR INCREASE CASTING COST BY REQUIRING WELD REPAIR.

SOLUTION - THIS PROJECT WILL SEEK TO IDENTIFY AND ELIMINATE THE MAJOR CAUSES OF NON-METALLIC INCLUSIONS IN CASTINGS. THE FINDINGS WILL BE APPLIED TO THE CASTING OF HIGH STRENGTH INCO 718 IMPELLERS AND OTHER CRITICAL COMPONENTS

(7402) TITLE - CAST INTEGRAL LOW PRESS TURBINE ROTOR

65D 112D

PROBLEM - THE CURRENT PRACTICE FOR MFG T700 TURBINES IS TO ATTACH CAST TURBINE BLADES TO A FORGED DISK. EXTENSIVE MACHINING OF THE AIRFOIL AND DISK DOVETAIL JOINTS IS REQ'D.

SOLUTION - DEVELOP THE PROCESS FOR INTERGRALLY CAST BLISKS AND PERFORM ENDURANCE TESTING.



FUNDING (\$000)

PRIOR 82 83 84 85 86

(CONTINUED)

COMPONENT --- TURBINE ROTORS

(7408) TITLE - MONU-ROTOR FA6 FOR APU APPLICATIONS

PROBLEM - THE ROTOR T42T-40 APU COSTS APPROXIMATELY 60 PERCENT OF THE ACQUISITION COST OF THE ENGINE AFTER ASSEMBLY AND BALANCE.

SOLUTION - THE ROTOR ASSEMBLY FABRICATION METHOD HAS BEEN SIMPLIFIED BY REPLACING THE EXISTING ROTOR BY A SINGLE CASTING AND INERTIA WELDING THIS TO A SHAFT. THIS INTEGRAL MONOROTOR AND SHAFT CAN BE BALANCED IN THE FACTORY PROVIDING A SINGLE LOW-COST COMPONENT.

(7409) TITLE - IMPROVED CAST TURBINE ROTOR

PROBLEM - DIFFICULTIES HAVE BEEN ENCOUNTERED IN CASTING IN792 FOR POWER TURBINE ROTORS AS THE ROTORS ARE SHROUDED AND CONTAIN RELATIVELY LONG SLENDER AIRFOILS ATTACHED TO LARGE HUBS DESPITE THE UTILIZATION OF HIP TECHNIQUES.

SOLUTION - SELECTED ALLOYS AND PROCESSES WILL BE EVALUATED IN A FULL SCALE ROTOR CONFIGURATION USING IN 792 AS A BASELINE.

(7411) TITLE - SECOND GENERATION DUAL PROPERTY TURBINE ROTORS

PROBLEM - SECOND GENERATION TURBINE DESIGNS COULD BECOME SIGNIFICANTLY MORE ATTRACTIVE IN COST AND PERFORMANCE BY IMPLEMENTATION OF ADVANCED MATERIALS AND DESIGN CONCEPTS.

SOLUTION - FABRICATE SECOND GENERATION DISKS BY THE LOWER COST CAP (CONSOLIDATION BY ATMOSPHERIC PRESSURE) TECHNIQUE. MANUFACTURE IMPINGEMENT TUBES BY CASTING THEM AS AN INTEGRAL COMPONENT.

(7413) TITLE - COOLED RADIAL TURBINE MFG PROCESS

PROBLEM - THE PERFORMANCE AND FUEL CONSUMPTION OF GAS TURBINES IS DIRECTLY RELATED TO THE TURBINE INLET TEMP AND THEREFORE TO THE MAX ALLOWABLE METAL TEMP IN THE TURB BLADING. CURRENT PRODUCTION APUs EXTENSIVELY EMPLOY UNCOOLED RADIAL TURBINE ROTORS.

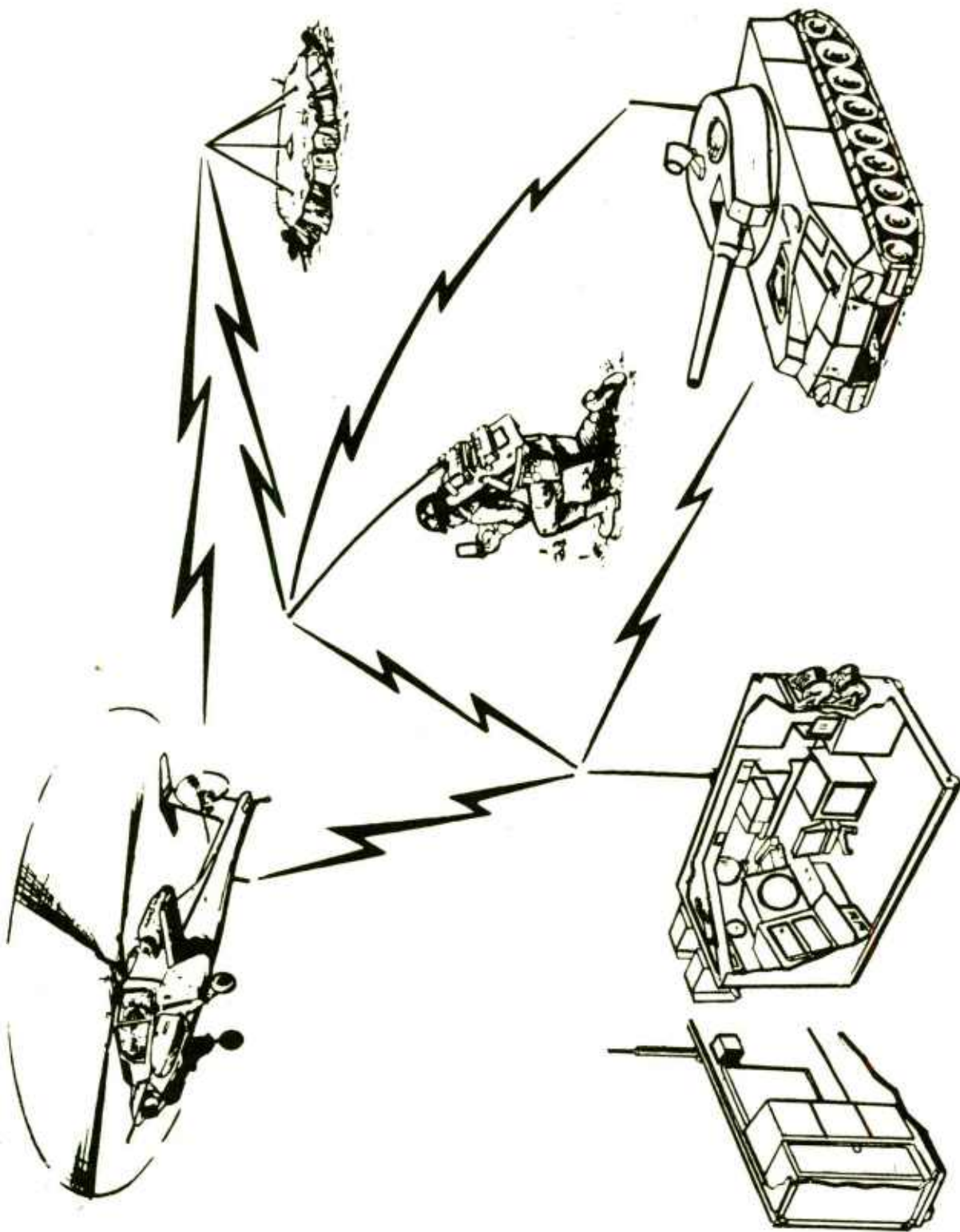
SOLUTION - DEVELOP THE PROCESS FOR MANUFACTURING AN UNCOOLED RADIAL TURBINE ROTOR, CONSISTING OF ADVANCED BLADE MATERIALS BONDED TO A POWDER METAL HUB, CAPABLE OF OPERATING AT A TURBINE INLET TEMP SEVERAL HUNDRED DEGREES HIGHER THAN EXISTING APUs.

220

330 350

330 350 400

300



COMMUNICATIONS & ELECTRONICS COMMAND (CECOM)

<u>CATEGORY</u>	<u>PAGE</u>
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US ARMY COMMUNICATIONS AND ELECTRONICS COMMAND  
(CECOM)

The US Army Communications and Electronics Command (CECOM), headquartered at Ft. Monmouth, NJ, is responsible for research, development, production, and fielding of communications, tactical data, and command and control systems for the Army. CECOM consists of laboratory and technical support segments and Project Managers of Multi-Service Communications System (MSCS), Army Tactical Communications System (ATACS), and project managed elements of Army Tactical Data Systems (ARTADS), i.e., Tactical Fire Control System (TACFIRE), Missile Minder (AN/TSQ-37), Tactical Operations System (TOS), and Position Location Reporting System (PLRS).

CECOM's planned projects cover a variety of electronics problems with special emphasis on computer applications and circuit technology. Projects support efficient manufacturing of custom components for use in future tactical radios.

Four proposed projects will develop advanced methods for production of detector materials needed for night vision devices. Currently, photo-detectors are produced on a small scale under laboratory conditions. Unit costs are high and quality and repeatability are low. Three of the projects are directed to the high quantity processing of large diameter mercury-cadmium-telluride boules, while the fourth project will establish automatic inspection capabilities for the HgCdTe wafers.

Several projects will obtain the necessary manufacturing technology for the precision crystals and temperature compensated resonators needed to meet the frequency stability requirements of Army tactical radios.

Program funding in the out-years largely anticipates micro-electronics as the driving force in componentry and built-in test capability for command, control, and communications systems. Computer-dominated methodologies are inherent in such areas as design, manufacture, and manufacturing documentation for communications systems and are expected to be of particular value for the short lead time, low volume production anticipated for future equipment and systems.

C E C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY	FY82	FY83	FY84	FY85	FY86
-----	----	----	----	----	----
DETECTORS	0	0	0	2050	0
DISPLAYS	950	0	0	0	0
FACTORY MODERNIZATION	0	2000	3027	0	0
FREQUENCY CONTROL	0	0	2417	0	0
GENERAL	100	120	1933	2200	0
INTEGRATED ELECTRONICS	1220	0	500	0	0
OPTICS	0	450	1750	500	0
SOLLO STATE	0	500	0	0	0
	-----	----	----	----	----
TOTAL	2270	3070	9627	4750	0

MMT FIVE YEAR PLAN  
KCS DRCMT 126

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*#DETECTORS\*  
\*\*\*\*\*

FUNDING (\$DOD)

PRIOR 82 83 84 85 86  
-----

COMPONENT -- PHOTODETECTORS

(3101) TITLE - AUTOMATIC PURIFICATION OF TELLURIUM

450

PROBLEM - PART PER BILLION PURITY OF TELLURIUM IS A LIMITING FACTOR IN ACHIEVEMENT OF HIGH PURITY MERCURY-CADMIUM-TELLURIUM DETECTOR MATERIAL.

SOLUTION - IMPLEMENT NEW TECHNIQUE FOR DISTILLATION AND SENSITIVE IMPURITY ANALYSIS.

(3102) TITLE - LARGE MERCURY CADMIUM TELLURIDE BOULES

850

PROBLEM - QUANTITY OF USEABLE WAFERS FROM SMALL DIAMETER BOULE IS LIMITED.

SOLUTION - PROVIDE TECHNOLOGY FOR LARGER DIAMETER OF BOULE MANUFACTURING.

(3103) TITLE - BATCH RECRYSTALLIZATION OF HGCDTE BOULES

350

PROBLEM - MANUALLY CONTROLLED ANNEALING LENGTHENS PRODUCTION TIME, LIMITS PRODUCTION RATE.

SOLUTION - INSTALL LARGER BATCH-PROCESSING CAPACITY WITH AUTOMATIC CONTROL.

(3104) TITLE - AUTO INFRARED SCANNING OF HGCDTE WAFERS

400

PROBLEM - MANUAL INFRARED SCANNING OF WAFERS TO DETERMINE THEIR QUALITY IS SLOW, REQUIRES LENGTHY SETUP AND PRODUCES INCONSISTENT RESULTS.

SOLUTION - ESTABLISH AUTOMATIC SCANNING TECHNIQUES WITH CONTROL SOFTWARE.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*#DISPLAYS\*  
\*\*\*\*\*

COMPONENT -- MISCELLANEOUS

(3073) TITLE - TACTICAL GRAPHICS DISPLAY PANEL

950

PROBLEM - FAB OF ELECTROLUMINESCENT DISPLAY PANELS REQUIRES REPRODUCIBLE DISPOSITIONS OF ELECTROLUMINESCENT PHOSPHOR DIELECTRIC LAYER AND TRANSPARENT CONDUCTORS. INTERCONNECTION OF INTEGRATED DRIVER AND SHIFT REGISTER CIRCUITS IS NECESSARY.

SOLUTION - UNIFORM REPEATABLE THIN FILM DEPOSITIONS WILL BE ESTABLISHED OVER SUBSTRATE SIZES UP TO 12 INCH DIAGONAL MEASURE. COST WILL BE REDUCED BY OPTIMUM CLEANING, HANDLING, AND PRODUCTION SEALING TECHNIQUES.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*#FACTORY MODERNIZATION\*  
\*\*\*\*\*



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- JTIDS

(3094) TITLE - COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS

PROBLEM - COMMUNICATIONS EQUIPMENT IS MANUFACTURED USING LABOR INTENSIVE, LOW VOLUME PROCESSES. MACHINES ARE OLD AND UNAUTOMATED. NEW METHODS, PROCESSES AND EQUIPMENT ARE NEEDED.

SOLUTION - USE FLEXIBLE MANUFACTURING TECHNIQUES, COMPUTER AIDED MANUFACTURING, GROUP TECHNOLOGY, COMPUTER CONTROLLED EQUIPMENT, ROBOTS, AND AUTORIZED CONVEYORS. USE AUTOMATIC INSERTION, VAPOR PHASE AND WAVE SOLDERING, AND NUMERICALLY CONTROLLED MACHINING.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*FREQUENCY CONTROL \*  
\*\*\*\*\*

COMPONENT -- CRYSTALS

(3047) TITLE - LOW COST HIGH STABILITY QUARTZ RESONATORS

PROBLEM - SINGCARS FREQUENCY STABILITY REQUIREMENTS CANNOT BE MET WITH PRESENTLY AVAILABLE MASS PRODUCED CRYSTALS. HAND PICKED, LOW YIELD CRYSTALS ARE REQUIRED AND PRODUCTION PROBLEMS WILL ARISE DUE TO A SHORTAGE OF PRECISION CRYSTALS.

SOLUTION - ACHIEVE THE TECHNOLOGY NECESSARY TO PRODUCE LARGE QUANTITIES OF HIGH STABILITY, LOW COST CRYSTALS.

COMPONENT -- OSCILLATORS

(3048) TITLE - MICROPROCESSOR COMPENSATED CRYSTAL OSCILLATOR

PROBLEM - LOW POWER TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS WITH STABILITY (1-5X10E-7) SUITABLE FOR USE IN JAM PROOF ARMY RADIOS (SINGCARS) ARE NOT AVAILABLE IN PRODUCTION QUANTITIES.

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR COST EFFECTIVE, LONG LIFE, STABLE TCXOS WHICH UTILIZE MICROPROCESSOR FOR TEMPERATURE COMPENSATION FUNCTION.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*GENERAL \*  
\*\*\*\*\*

1082

1335

2000 3027

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- CIRCUITS

(3100) TITLE - PRINTED CIRCUIT BOARD FABRICATION IMPROVEMENTS 350

PROBLEM - FUTURE COMPONENT DENSITY, SOLDERING INTOLERANCE OF MANY COMPONENTS, AND REDUCED CURRENT LEVELS ARE FORCING REDUCTION OF ETCHED CONDUCTOR WIDTH AND SPACING. OPEN SOLDER BATHS ARE AN ENVIRONMENTAL CONCERN WHICH DICTATES NEED FOR NEW MANTECH.

SOLUTION - PROVIDE PRODUCTION TECHNOLOGY FOR BOARDS USING FINE WIRE AS CONDUCTOR MATERIAL WITH JOINTS FORMED BY COPPER PLATING OR LASER WELDING/SOLDERING.

COMPONENT -- MISCELLANEOUS

(3069) TITLE - SEGMENTATION OF ATE FUNCTIONS FOR PRODUCTION USE 120 850

PROBLEM - ARMY ELECTRONIC ITEMS MUST BE TESTED ON EXPENSIVE AUTOMATIC TESTERS THAT CONTAIN MORE CAPABILITY THAN NEEDED AND COST MORE THAN MOST FIRMS CAN AFFORD.

SOLUTION - RECONFIGURE THE AN/USM-410 EQUATE TESTER TO PERMIT A MINIMUM OF MODULES TO DO SOME LOW ORDER TESTING AND PERMIT ADD-ONS TO BE ADDED TO UPGRADE THE GEAR TO HANDLE ADDITIONAL TESTS AS NEEDED. WORK ON SOFTWARE COMPATIBILITY.

(3091) TITLE - LIGHTWEIGHT SURVIVABLE ANTENNA FOR ARMOR VEHICLES 100 500

PROBLEM - THE COST OF THE STANDBY ANTENNA USED ON ARMORED VEHICLES IS EXCESSIVE DUE TO THE EMPLOYMENT OF LOW USAGE, SPECIALIZED STEEL ALLOYS AND THE LONG PROCESSING TIME SUCH MATERIALS REQUIRE.

SOLUTION - THE CURRENT HEAVY STEEL PLATE ANTENNA WILL BE REPLACED WITH A REINFORCED PLASTIC (COMPOSITE) ANTENNA WITHOUT ALTERING ELECTRICAL PROPERTIES. THE RADIATING MEMBER WILL BE METAL PLATED.

(3095) TITLE - AUTO REVIEW AND VERIFICATION OF TECH DATA PACKAGES 350 500

PROBLEM - APPROXIMATELY 85% OF CECOM'S NEW ENGINEERING DRAWINGS ARE PREPARED MANUALLY BY A DRAFTSMAN. THIS METHOD IS LABOR INTENSIVE, TIME CONSUMING, ERROR PRONE, AND NOT FLEXIBLE FOR MULTIPLE ENGINEERING CHANGES.

SOLUTION - THE ENGINEERING DATA BOTH NEWLY ACQUIRED AND ARCHIVED WILL BE DIGITIZED AND STORED IN ELECTRONIC MEDIA. PROCEDURES WILL BE IDENTIFIED FOR USING COMMERCIALY AVAILABLE COMPUTER SYSTEMS.

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(3096) TITLE - AUTO SUPPORT FOR RAM PROGRAM

583

PROBLEM - PROCEDURES FOR THE ACQUISITION AND MAINTENANCE OF DATA FOR DARCOM RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAM) PROGRAM ARE MANUAL, TIME CONSUMING AND ERROR PRONE. INACCURATE DATA IS PROCURED AND THE RESULTS OF ENGINEERING CHANGES ARE NOT TRACED

SOLUTION - THE REQUIREMENTS FOR AN AUTOMATED DATA BASE WILL BE ESTABLISHED. THE ASSOCIATED TOOLS WILL PERMIT THE AUTOMATIC GENERATION OF DATA AND REPORTS THROUGH THE PRODUCT LIFE CYCLE.

(9289) TITLE - AUTOTEST OF MICROWAVE DEVICE WAFERS (CAM)

500

PROBLEM - THE NEED TO WAIT UNTIL PACKAGING IS COMPLETE BEFORE TESTING MICROWAVE DEVICES (DIODES, TRANSISTORS) RUNS UP THE COST BECAUSE PACKAGING COST IS APPRECIABLE. BUT TESTING OF DEVICE CHIPS CANNOT NOW BE DONE.

SOLUTION - DEVELOP AN AUTOMATED MEASURING SYSTEM FOR EVALUATION THE SEMICON MTL. AT THE WAFER LEVEL, CHECKING EACH DIE AUTOMATICALLY. PERFORM BOTH DC AND RF PROBE MARK UNDER-SPEC DIES. PROVIDE DIAGNOSTIC DATA TO PERMIT CHANGING THE PROCESS TO IMPROVE YIELD.

(9290) TITLE - AUTOMATIC MICROWAVE SEMICONDUCTOR DEVICE TESTING (CAM)

500

PROBLEM - PRESENT PRODUCTION TESTING METHODS FOR HIGH FREQUENCY DEVICES ARE INADEQUATE. DEVICE CHARACTERIZATION IS SLOW AND EXPENSIVE, AND IS MOSTLY DONE BY HAND. SMALL SIGNAL READINGS CAN BE TAKEN BUT NOT LARGE SIGNAL READINGS.

SOLUTION - MODIFY AND EXTEND PRESENT AUTOMATIC TEST EQUIPMENT, FIXTURES AND COMPUTER ROUTINES TO NON-DESTRUCTIVELY TEST HIGH FREQUENCY DEVICES, CAPTURE DATA ON DEVICE PARAMETERS AND QUALITY. MODIFY AN AUTOMATIC NETWORK ANALYZER TO DO THIS. USE DATA IN DESIGN

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\* C A T E G O R Y \*  
\*-----\*  
\*INTEGRATED ELECTRONICS \*  
\*\*\*\*\*

COMPONENT -- CIRCUITRY

(3083) TITLE - 36-40 AND 54-58 GHZ GUNN OSCILLATOR PRODUCTION PROCESS

1220

PROBLEM - PRESENT METHODS OF MANUAL ASSY, TESTING, TRIMMING AND ADJUSTING OF SUBASSEMBLIES AND FINAL ASSY IS COSTLY. SUCH METHODS WILL NEGATIVELY EFFECT PROVISIONING AND MAINTENANCE BECAUSE OF PARTS INTERCHANGEABILITY PROBLEMS

SOLUTION - ESTABLISH MANUFACTURING PROCEDURES FOR NEW MODULE WITH 50 PERCENT DECREASE IN PARTS COUNT, IMPROVED PARTS UNIFORMITY AND REDUCED PRODUCTION COST.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
-----

COMPONENT --- CIRCULTRY

(CONTINUED)

(9773) TITLE - COMPUTER AID F/PREP OF AUTO ANALOG CIRCUIT PRODN TEST PROG

500

PROBLEM - INDUSTRY DOES NOT POSSESS PROGRAMS TO VALIDATE THE TEST PROGRAMS REQUIRED TO TEST ANALOG CIRCUITS.

SOLUTION - PREPARE A TESTING PROGRAM THAT WILL VALIDATE AND EVALUATE ANALOG TEST PORGRAMS.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*OPTICS\*  
\*\*\*\*\*

COMPONENT --- FIBER

(3089) TITLE - CONTINUOUS OPTIC FIBER FROM DOMESTIC MATERIALS

45D 350 500

PROBLEM - AN AUTOMATIL VAPOR-PHASE AXIAL DEPOSITION (VAD) PROCESS WILL BE ADAPTED TO FORM SILICA FOR OPTIC FIBER. THIS PROCESS WILL ELIMINATE SILICA DEPENDENCE UPON FOREIGN SOURCE AVAILABILITY, UNIFORMITY AND PRICE.

SOLUTION - AUTOMATIC COMPUTER CONTROL WILL BE UTILIZED TO REGULATE GAS FLOW RATES AND MATERIAL DEPOSITION THICKNESS. GLASS SINTERING TEMPERATURE ? TARGET AREA TEMPERATURE PROFILE WILL BE OPTIMIZED. TARGET RUTATIONAL SPEED WILL BE DETERMINED.

(3090) TITLE - GAINASP LIGHT EMITTING DIODES

65D

PROBLEM - THE PRESENT METHOD OF FABRICATION IS LOW VOLUME AND LABOR INTENSIVE. LEDS ADAPTABLE TO MILITARY SYSTEMS ARE AVAILABLE BUT INDUSTRY WILL NOT DEVELOP WITH ITS OWN FUNDS BECAUSE OF LIMITED PRODUCTION PROCUREMENT.

SOLUTION - SEMI-AUTOMATIC PROCESSES WILL ADDRESS MOUNTING, CONTACT WIRE ATTACHMENT,PACKAGE ASSEMBLY,ALIGNMENT OF THE FIBER OPTIC AND FINAL ACCEPTANCE TESTING. OTHER AREAS ARE EPITAXY,ETCHING,MASKING,DICING,COATINGS AND SEALING.

(9784) TITLE - RUGGEDIZED TALTICAL FIBER OPTIC CABLE ASSEMBLY

75D

PROBLEM - APPLYING A PROTECTIVE COATING ONTO EACH FIBER HAS NOT BEEN DONE IN PRODUCTION QUANTITIES. BUNDLING THE FIBERS AND APPLYING A PLASTIC SHEATH MUST BE WORKED OUT.

SOLUTION - DEVELOP EQUIPMENT TO EXTRUDE A PLASTIC KYNAR COVERING ONTO EACH OPTIC FIBER AND EXTRUDE A PROTECTIVE PLASTIC SHEATH OVER THE CABLE. ESTABLISH TERMINATION METHODS.

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\* C A T E G O R Y \*  
\*-----\*  
\*SOLID STATE\*  
\*\*\*\*\*

FUNDING (\$DDD)

PRIOR 82 83 84 85 86

COMPONENT --- SWITCHES

(3D68) TITLE - INCREASE PRODUCEABILITY OF VARACTORS AND PIN DIODES

5DD

PROBLEM - PRESENTLY AVAILABLE VARACTORS AND PIN DIODES MADE BY SILICON DIODE TECHNOLOGY ARE EXPENSIVE. THE IR PRODUCTION TECHNIQUES ARE VERY LABOR INTENSIVE, YIELDS ARE LOW, AND UNIFORMITY IS POOR. MATCHING REQUIRES EXTENSIVE TESTING.

SOLUTION - USE GALLIUM ARSENIDE FOR THESE DEVICES. USE AUTOMATIC CONTROL SYSTEM FOR PROCESSES INSTEAD OF MANUAL PROCEDURES TO INCREASE YIELD. DEPOSIT A MEDIUM TEMPERATURE PASSIVATION LAYER ON PIN DIODES TO IMPROVE RELIABILITY AND UNIFORMITY.

FUNDING (\$0000)

PRIOR 82 83 84 85 86  
-----

COMPONENT -- CIRCUITRY

(CONTINUED)

(9773) TITLE - COMPUTER AID F/PREP OF AUTO ANALOG CIRCUIT PRODN TEST PROG

500

PROBLEM - INDUSTRY DOES NOT POSSESS PROGRAMS TO VALIDATE THE TEST PROGRAMS REQUIRED TO TEST ANALOG CIRCUITS.

SOLUTION - PREPARE A TESTING PROGRAM THAT WILL VALIDATE AND EVALUATE ANALOG TEST PROGRAMS.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*OPTICS\*  
\*\*\*\*\*

COMPONENT -- FIBER

(3089) TITLE - CONTINUOUS OPTIC FIBER FROM DOMESTIC MATERIALS

500

PROBLEM - AN AUTOMATIL VAPOR-PHASE AXIAL DEPOSITION (VAD) PROCESS WILL BE ADAPTED TO FORM SILICA FOR OPTIC FIBER. THIS PROCESS WILL ELIMINATE SILICA DEPENDENCE UPON FOREIGN SOURCE AVAILABILITY, UNIFORMITY AND PRICE.

SOLUTION - AUTOMATIC COMPUTER CONTROL WILL BE UTILIZED TO REGULATE GAS FLOW RATES AND MATERIAL DEPOSITION THICKNESS. GLASS SINTERING TEMPERATURE ? TARGET AREA TEMPERATURE PROFILE WILL BE OPTIMIZED. TARGET ROTATIONAL SPEED WILL BE DETERMINED.

450

350

(3090) TITLE - GAINASP LIGHT EMITTING DIODES

650

PROBLEM - THE PRESENT METHOD OF FABRICATION IS LOW VOLUME AND LABOR INTENSIVE. LEDS ADAPTABLE TO MILITARY SYSTEMS ARE AVAILABLE BUT INDUSTRY WILL NOT DEVELOP WITH ITS OWN FUNDS BECAUSE OF LIMITED PRODUCTION PROCUREMENT.

SOLUTION - SEMI-AUTOMATIC PROCESSES WILL ADDRESS MOUNTING, CONTACT WIRE ATTACHMENT, PACKAGE ASSEMBLY, ALIGNMENT OF THE FIBER OPTIC AND FINAL ACCEPTANCE TESTING. OTHER AREAS ARE EPITAXY, ETCHING, MASKING, DICING, COATINGS AND SEALING.

(9784) TITLE - RUGGEDIZED TACTICAL FIBER OPTIC CABLE ASSEMBLY

750

PROBLEM - APPLYING A PROTECTIVE COATING ONTO EACH FIBER HAS NOT BEEN DONE IN PRODUCTION QUANTITIES. BUNDLING THE FIBERS AND APPLYING A PLASTIC SHEATH MUST BE WORKED OUT.

SOLUTION - DEVELOP EQUIPMENT TO EXTRUDE A PLASTIC KYNAR COVERING ONTO EACH OPTIC FIBER AND EXTRUDE A PROTECTIVE PLASTIC SHEATH OVER THE CABLE. ESTABLISH TERMINATION METHODS.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*SOLID STATE\*  
\*\*\*\*\*



FUNDING (\$DDD)

PRIOR 82 83 84 85 86

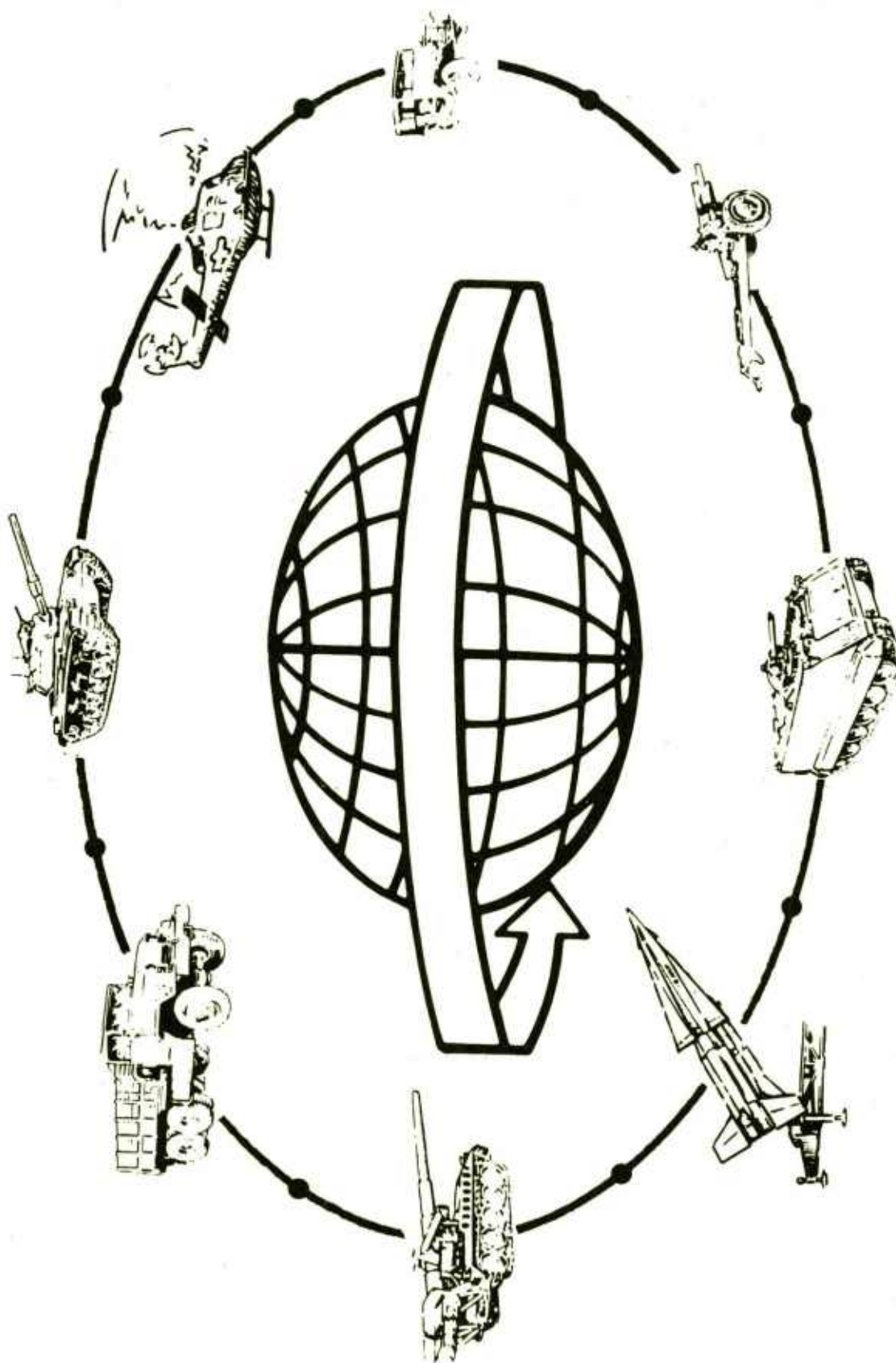
COMPONENT --- SWITCHES

(3D68) TITLE - INCREASE PRODUCEABILITY OF VARACTORS AND PIN DIODES

5DD

PROBLEM - PRESENTLY AVAILABLE VARACTORS AND PIN DIODES MADE BY SILICON DIODE TECHNOLOGY ARE EXPENSIVE. THE IR PRODUCTION TECHNIQUES ARE VERY LABOR INTENSIVE, YIELDS ARE LOW, AND UNIFORMITY IS POOR. MATCHING REQUIRES EXTENSIVE TESTING.

SOLUTION - USE GALLIUM ARSENIDE FOR THESE DEVICES. USE AUTOMATIC CONTROL SYSTEM FOR PROCESSES INSTEAD OF MANUAL PROCEDURES TO INCREASE YIELD. DEPOSIT A MEDIUM TEMPERATURE PASSIVATION LAYER ON PIN DIODES TO IMPROVE RELIABILITY AND UNIFORMITY.



**US ARMY DEPOT SYSTEM COMMAND  
(DESCOM)**

<u>CATEGORY</u>	<u>PAGE</u>
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## US ARMY DEPOT SYSTEM COMMAND

### (DESCOM)

The US Army Depot System Command (DESCOM), with headquarters at Letterkenny Army Depot, Chambersburg, Pennsylvania, commands and controls the twelve depots and seven depot activities in the United States and West Germany which comprise the US Army Depot System. Activated in September 1976, this command employs over 37,500 civilians and nearly 1,400 military personnel and manages an annual budget in excess of \$1.5 billion.

DESCOM is a major interface with the soldier in the field. The depots store and ship a broad range of general supplies and munitions managed by the Army Defense Logistics Agency, and other agencies, to US and allied units worldwide. Half of DESCOM's personnel and three-quarters of its budget are dedicated to depot-level maintenance on most of the equipment in the Army's inventory.

DESCOM's planned projects span repair and overhaul operations for tracked/wheeled vehicles and communications systems, and energy conservation.

The vehicle related projects include robotics applications which will reduce personnel exposure to hazardous cleaning and refinishing operations, and will improve repair procedures which are time consuming or labor intensive. Significant efforts are directed to the overhaul of track pads and shoes. These include an automated system for the disassembly of double pin track, a high pressure water jet system to remove worn rubber pads from the track shoe, and injection molding and curing processes for replacement pads.

In the communications/electronics area, DESCOM will conduct projects to refinish electronics shelters and to establish in-house capabilities for the test and repair of microwave power devices.

OESCOM  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY	FY82	FY83	FY84	FY85	FY86
ARMOR	0	162	340	0	0
BODY/FRAME	374	0	325	225	0
DRIVE SYSTEM	65	625	525	0	0
ELECTRON TUBES	0	0	176	0	0
FACTORY MODERNIZATION	200	2600	1400	500	500
GENERAL	0	420	95	925	0
TRACK	499	686	118	0	0
TOTAL	1138	4493	2979	1650	500

MMT FIVE YEAR PLAN  
RCS DRCHT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- HULL/BODY

(2001) TITLE - PROVIDE PROTOTYPE ROBOTS FOR AUTOMATED BLAST CLEANING

162 340

PROBLEM - HULLS OF VEHICLES ARE BLAST CLEANED TO REMOVE OLD PAINT AND RUST PRIOR TO PAINTING. THE CURRENT METHOD IS MANUAL. LABOR INTENSIVE, TIME CONSUMING, AND CREATES AN UNHEALTHY SITUATION FOR THE WORKERS.

SOLUTION - A FASTER, MORE PRODUCTIVE, AND MORE PRECISE BLAST CLEANING OPERATION WILL BE DEVELOPED USING INDUSTRIAL ROBOTS. A ROBOT SYSTEM USING THREE ROBOTS CONCURRENTLY WILL BE DESIGNED, INSTALLED, DEBUGGED, AND PROVEN OUT.

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\* C A T E G O R Y \*  
\*-----\*  
\*BOD Y/FRAME\*  
\*\*\*\*\*

COMPONENT -- LOATING

(4006) TITLE - ROBOTIC POLYURETHANE CAMOUFLAGE PAINTING

325 225

PROBLEM - CURRENTLY READ DOES NOT UTILIZE AUTOMATED ROBOTIC PAINTING CAMOUFLAGE PAINTING TECHNOLOGY.

SOLUTION - PROCURE A ROBOTIC PAINTING SYSTEM COMPLETE WITH A PAINT BOOTH, INFRA-RED TUNNEL, PAINT SYSTEM, TOW CONVEYOR, AND 3 EA. PROGRAMMABLE ROBOTS.

COMPONENT -- SUSPENSION SYSTEM

(4002) TITLE - ROBOTIZED WELDING OF M113A2 SUSPENSION

421 374

PROBLEM - THE CURRENT METHOD OF WELDING THE M113A2 SUSPENSION SYSTEM IS TIME CONSUMING AND LABOR INTENSIVE.

SOLUTION - ROBOTIZE THE WELDING OPERATION TO REDUCE MAN HOURS FROM ELEVEN TO SIX FOR A LABOR SAVING OF 58 DOLLARS PER HULL.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*DRIVE SYSTEM\*  
\*\*\*\*\*



FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- ENGINE

(17001) TITLE - AUTOMATED DYNAMOMETER CONTROL FOR STANDARDIZED INSP TESTING

PROBLEM - ALL ENGINES ARE TORN DOWN WHILE 20% COULD BE RESTORED TO OPERATION WITHOUT PHYSICAL TEARDOWN. TEARDOWN IS 1/3 COST OF OVERHAUL. ALL ENGINES REBUILT REQUIRE A 4 HOUR DYNAMOMETER OPERATIONAL TEST CYCLE.

SOLUTION - AUTOMATE CURRENT MANUALLY OPERATED DYNAMOMETER TEST CELLS ALLOWING PRESHOP INSPECTION WITHOUT TEARDOWN AND REDUCING REBUILT ENGINE RUN-IN TIME BY EIGHTY PERCENT.

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\* C A T E G O R Y \*  
\*-----\*  
\*ELECTRON TUBES \*  
\*\*\*\*\*

COMPONENT -- POWER

(0004) TITLE - MICROWAVE POWER DEVICE PERFORMANCE ANALYSIS CAPABILITY

PROBLEM - INOPERATIVE MICROWAVE TUBES AND DEVICES REQUIRE SCREENING TO VERIFY TUBE CONDITION AND MARGINAL PERFORMANCE FOR DETERMINING REPAIR WORK. SCREENING IS PERFORMED MANUALLY WHICH IS TIME CONSUMING, INACCURATE AND COSTLY.

SOLUTION - AN AUTOMATED SCREENING FACILITY WHICH INCLUDES FIXTURING, TEST EQUIPMENT, POWER SUPPLIES AND REQUIRED CONTROLS WILL BE SET-UP USING INDIVIDUAL TEST STATIONS FOR ANALYZING FAILED MICROWAVE DEVICES.

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\* C A T E G O R Y \*  
\*-----\*  
\*FACTORY MODERNIZATION \*  
\*\*\*\*\*

COMPONENT -- MISCELLANEOUS

(2002) TITLE - LONG RANGE DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM - LEAO.

PROBLEM - THE LACK OF UP-TO-DATE MANUFACTURING AND PROCESSING TECHNOLOGY HAS RESULTED IN HIGHER OVERHAUL/REBUILD COSTS AND ALSO IN LIMITATIONS TO BOTH PRESENT AND FUTURE MISSION NEEDS THROUGHOUT THE DEPOT.

SOLUTION - UPDATE THE DEPOT WITH THE LATEST STATE-OF-THE-ART EQUIPMENT AND PROCESS TECHNOLOGY AVAILABLE TO SUPPORT THE PRESENT AND FUTURE WORKLOADS AND MISSIONS.

(8001) TITLE - ANNISTON PRODUCTIVITY IMPROVEMENT PROGRAM (PHASE I)

PROBLEM - PRODUCTION AND STORAGE FACILITIES ARE OLD, CROWDED, AND/OR FUNCTIONALLY UNSUITED FOR THE ACTIVITIES HOUSED. TOOLS AND EQUIPMENT ARE ON THE AVERAGE 25 YEARS BEHIND THE STATE-OF-THE-ART.

SOLUTION - ANALYZE ANADS PRODUCTION OPERATIONS IN TERMS OF PRODUCTIVITY.

176

100 1400 1400 500 500

100 1200

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 \* C A T E G O R Y \*  
 \*-----\*  
 \*GENERAL\*  
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MMT FIVE YEAR PLAN  
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

(00D2) TITLE - CAM APPLICATION OF ROBOTICS TO SHELTER REFINISHING

420

PROBLEM - SPRAY PAINTING AND SANDING OF ALUM SKINNED MILITARY CONTAINERS IS LABOR INTENSIVE AND CREATES A HARSH WORKING ENVIRONMENT. DEVICES TO SENSE PRESENCE AND ABSENCE OF PAINT + TO CONTROL HEAT BUILD-UP TO PREVENT ALUM SKIN DELAMINATION ARE NEEDED.

SOLUTION - DEVELOP A ROBOT EQUIPMENT SPECIFICATION AND DESIGN WITH NECESSARY FEEDBACK MECHANISMS.

(20D3) TITLE - PROCESS ENERGY CONSERVATION AT LETTERKENNY ARMY DEPOT

95 925

PROBLEM - AN EXCESS VOLUME OF ENERGY IS BEING CONSUMED ON DEPOT VIA PROCESS ENERGY (MISSION ACTIVITIES SUCH AS PRODUCTION, MAINTENANCE, TESTING, AND DEVELOPMENT). THE EXISTING EMCS IS NOT EMPLOYED TO MONITOR OR CONTROL PROCESS ENERGY.

SOLUTION - THE EMCS MUST BE EFFECTIVELY APPLIED IN ORDER TO REALIZE A SIGNIFICANT ENERGY REDUCTION IN THE AREA OF PROCESS ENERGY CONSUMPTION.

\*\*\*\*\*  
 \* C A T E G O R Y \*  
 \*-----\*  
 \*TRACK\*  
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COMPONENT -- RUBBER PADS

(4003) TITLE - RUBBER INJECTION MOLDING OF DOUBLE PIN TRACK

345 118

PROBLEM - REBUILD OF TRACK BLOCKS FOR COMBAT VEHICLES IS CURRENTLY BEING ACCOMPLISHED WITH 1940'S TECHNOLOGY. THIS REQUIRES THE BONDING OF RAW RUBBER TO THE STEEL BASE COMPONENT AND COMPRESSION CURING FOR TWO HOURS.

SOLUTION - ESTABLISH AN AUTOMATED (ROBOT) INJECTION MOLDING PROCESS THAT WILL CURE THE RUBBER TRACK PAD ON THE TRACK SHOE IN TEN MINUTES OR LESS.

(4005) TITLE - WATER JET MATERIAL REMOVAL SYSTEM

125 200

PROBLEM - CURRENT PRODUCTION METHODS OF REMOVING RUBBER FROM TRACK COMPONENTS ARE LABOR INTENSIVE AND PRESENT ENVIRONMENTAL AND SAFETY HAZARDS TO THE WORKERS.

SOLUTION - DESIGN, WRITE SPECIFICATIONS, AND FABRICATE A PROTOTYPE PRODUCTION HIGH PRESSURE WATER JET SYSTEM TO REMOVE THE RUBBER FROM THE TRACK COMPONENTS.

MMT FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

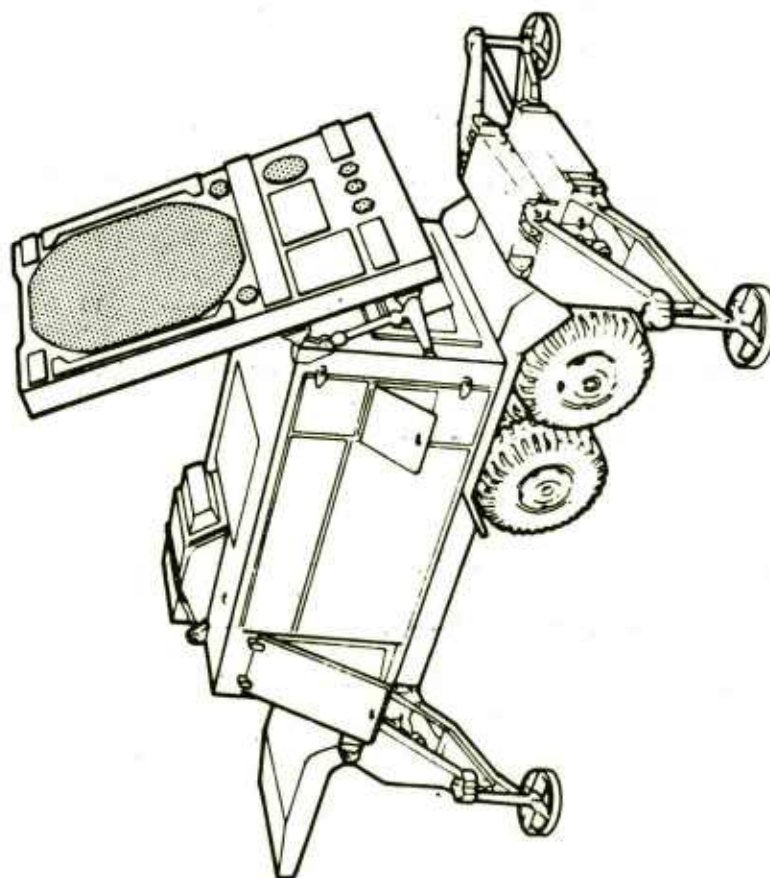
COMPONENT -- SHOES

(4DD4) TITLE - AUTOMATED DISASSEMBLY OF DOUBLE PIN TRACK

299 341

PROBLEM - DISASSEMBLY OF DOUBLE PIN TRACK SHOE SET ASSEMBLIES IS CURRENTLY  
LABOR INTENSIVE USING MANUAL HAND TOOLS RESULTING IN LOW PRODUCTIVITY.

SOLUTION - ESTABLISH AN AUTOMATED DISASSEMBLY PROCESS FOR DOUBLE PIN TRACK  
SHOE ASSEMBLIES.



## **ELECTRONICS R&D COMMAND (ERADCOM)**

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# US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND

## (ERADCOM)

ERADCOM is the Army's focal point for electronics research, development and acquisition (RDA) activities, and maintains programs in such areas as electronics signal intelligence, electronic warfare, atmospheric sciences, target acquisitions and combat surveillance, electronic fuzing, radars, sensors, night vision, radar frequency and optical devices, nuclear weapons effects, instrumentation and simulation, and fluidics.

Seven laboratories are integrated into ERADCOM's structure. These laboratories are product oriented and as a result can identify major problem areas where applied MMT efforts can provide important benefits. Although ERADCOM and its laboratories identify and manage projects, the bulk of the actual work is contracted out to industry.

In the category of integrated electronics, ERADCOM will pursue the establishment of various technologies for Very High Speed Integrated Circuits (VHSIC). These newly identified projects, beginning in FY85, include a manufacturing capability for microelectronic packages, an interconnection method for microelectronic packages, a direct write electron beam patterning process, and fabrication methods for low cost, stable, and durable X-ray masks and mask membranes.

Improving sighting capabilities is an area of prime concern to all the Services. Several projects for significant improvements in production techniques for image intensifiers are included in the Plan. The development of millimeter wave and infrared laser systems for all-weather and smoke fighting is being pursued. This will require the development of new sensors for control systems. Improved techniques will be needed to insure the quality and quantity of such systems. Projects are also included that deal with thermal optical systems. These include the present generation Common Modules and future second generation systems such as the ATAC and MISTAF FLIRS (Forward Looking Infrared Systems) and the Thermal Weapon Sight (TWS).



C O M M A N D      E R A O C L U M  
F U N D I N G      S U M M A R Y  
(T H O U S A N D S)

CATEGORY -----	FY82 -----	FY83 -----	FY84 -----	FY85 -----	FY86 -----
DETECTORS	0	6970	2510	5846	5123
DISPLAYS	309	0	0	0	0
ELECTRON TUBES	1298	1350	744	875	0
FACTORY MODERNIZATION	0	0	1500	0	0
FREQUENCY CONTROL	0	0	0	1100	800
GENERAL	0	2565	0	100	850
INTEGRATED ELECTRONICS	1179	480	500	2838	2600
LASER	0	0	0	1964	948
OPTICS	0	0	0	715	1035
PASSIVE COMPONENTS	596	0	696	0	0
POWER SOURCES	0	373	475	725	2300
SOLID STATE	1179	292	280	500	2600
	-----	-----	-----	-----	-----
TOTAL	4561	12030	6705	14663	16456

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 \* C A T E G O R Y \*  
 \*-----\*  
 \*DETECTORS\*  
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MMT FIVE YEAR PLAN  
 RCS DRCMT J26

FUNDING (\$000)

PRIOR B2 83 84 85 86  
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COMPONENT --- ARRAYS

(5057) TITLE - 3-5 MICRON TE COOLED FOCAL PLANE MODULES

410 1466 1213

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 3-5 MICRONS REQUIRE USE OF HIGH DENSITY MATRIX DETECTOR ARRAY IN THE ORDER OF 2000 ELEMENTS. THIS EQUIPMENT CAN'T BE PRODUCED WITH TODAY'S THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE ARRAY COOLER/DEWAR MODULES TO OPERATE AT 195 K. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.

(5063) TITLE - VACUUM DEWARS FOR MOSAIC ARRAYS FOR 2ND GEN. FLIR

400

PROBLEM - NEW DEWAR CONCEPTS MUST BE ESTABLISHED TO HOUSE THE NEW GENERATION FOCAL PLANE ARRAYS SUCH THAT VACUUM INTEGRITY AND MECHANICAL STABILITY ARE MAINTAINED.

SOLUTION - DEVELOP PRODUCTION TECHNIQUES FOR LOW OUT-GASSING DEWAR COMPONENTS.

(5077) TITLE - 2 GEN 8-12 MICRON COMMON MODULE F.P. RETROFIT

1000

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 8-12 MICRONS REQUIRE USE OF HIGH DENSITY MATRIX DETECTOR ARRAY IN THE ORDER OF 10000 ELEMENTS. THIS EQUIPMENT CAN'T BE PRODUCED WITH TODAY'S THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE ARRAY COOLER/DEWAR MODULES FOR COMMON MODULE RETROFIT PROGRAMS.

(5125) TITLE - ROOM TEMPERATURE MMW DETECTOR ARRAYS

650

PROBLEM - EFFICIENT RADIATION COUPLING BETWEEN ANTENNAS AND DETECTORS REQUIRES EXTREME DIMENSIONAL AND INDEX OF REFRACTION TOLERANCES.

SOLUTION - DEVELOP METHODS TO DEPOSIT DIELECTRIC / THIN FILM METAL WAVEGUIDE STRUCTURES WITH PREDICTABLE AND CONTROLABLE EFFECTIVE INDICES OF REFRACTION.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- ARRAYS

(CONTINUED)

(9151) TITLE - LIQUID PHASE EPITAXIAL HGCOTE

2D0D 14DD

PROBLEM - LOW YIELD ON CURRENT METHOD OF MANUFACTURE OF COMMON MODULE DETECTOR ARRAYS. GROWTH OF HGCOTE CRYSTALS REQUIRES MANUAL LAPPING, POLISHING ? THINNING TO ACHIEVE PERFORMANCE SPECIFICATIONS.

SOLUTION - USE LIQUID PHASE EPITAXIAL GROWTH OF THIN-FILM ON COTE SUBSTRATE ELIMINATING MANUAL STEPS.

(9221) TITLE - THERMAL WEAPONS SYSTEM (TWS) ADVANCED FUCAL PLANE. PHASE I 365

PROBLEM - HIGH DENSITY MATRIX DETECTOR ARRAYS CANNOT BE PRODUCED WITH CURRENT THERMAL IMAGERY ARRAY TECHNOLOGY.

SOLUTION - ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE MODULES. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.

COMPONENT -- INFRARED/UV

(9045) TITLE - THERMOELECTRIC COOLER MATERIALS

280 32D

PROBLEM - SUPERIOR HIGH PERF. MATERIALS REQUIRED FOR 2 GEN. FLIR TE COOLERS ARE AVAILABLE ONLY IN RESEARCH QUANTITIES + QUALITIES. TRANSITION FROM RESEARCH TO PRODUCTION WILL INTRODUCE VARIOUS DEGRADATION FACTORS.

SOLUTION - ESTABLISH PRE-PRODUCTION METHODS + TECHNIQUES FOR HIGH QUALITY CONTROL NECESSARY TO MEET 2 GEN. FLIR DEMANDS.

(9049) TITLE - EBS-CCO ARRAYS (8DOX80D)

1500

PROBLEM - 8DD X 8DD ELEMENT CDD ARRAYS ARE CURRENTLY BEING FABRICATED IN THE RESEARCH LAB WITH LOW YIELD AND H

SOLUTION - DEVELOP MANUFACTURING METHODS TO IDENTIFY AND MAXIMIZE YIELD AND MINIMIZE COST IGH CEST

(9059) TITLE - LINEAR RESONANCE COOLERS - PHASE I

50D 50D

PROBLEM - SECOND GENERATION FLIR'S WILL EMPLOY MAGNETIC SUSPENSIONS IN THE CRYOGENIC COOLERS. MAINTAINING CRITICAL SUSPENSION TOLERANCES IN PRODUCTION WILL REQUIRE DEVELOPING EXTENSIVE QUALITY CONTROL PROCEDURES.

SOLUTION - DEVELOP MANUFACTURING METHODS FOR MAINTAINING CRITICAL TOLERANCES.

(9073) TITLE - ADVANCED MECHANICAL COOLERS FOR 2ND GEN. FLIR'S

850

PROBLEM - SECOND GEN IR SENSORS ARE NOW VERY SUSCEPTIBLE TO VIBRATIONS AND THERMAL FLUCTUATIONS TO A LARGER DEGREE THAN CONVENTIONAL FIRST GEN SYSTEMS.

SOLUTION - DEVELOP MANUFACTURING TECHNIQUES FOR REDUCING THERMAL FLUCTUATIONS AND VIBRATIONS

FUNDING (\$DDO)

PRIOR 82 83 84 85 86  
-----

COMPONENT --- INFRARED/UV

(CONTINUED)

(5086) TITLE - SOLID STATE PYROELECTRIC IMAGER

1000

PROBLEM - LOW YIELD OF PYROELECTRIC MATERIAL SUITABLE FOR RETINA. LOW YIELD OF INTERCONNECT FROM PYROELECTRIC MATERIAL TO THE CCD.

SOLUTION - DEVELOP METHODS FOR THE PRODUCTION OF LARGE AMOUNTS OF PYROELECTRIC MATERIAL. DEVELOP INTERCONNECT TECHNIQUES FOR THE PRODUCTION OF PYROELECTRIC RETINA.

(5180) TITLE - MMT FOR METAL DEWAR AND UNBOUNDED LEADS

3800 700

PROBLEM - THE GOLD WIRE BONDED CONNECTIONS ARE MADE BY HAND WHICH IS A TEDIOUS AND EXPENSIVE PROCESS. THE GLASS STEM IS HAND FASHIONED AND IS PRONE TO DAMAGE.

SOLUTION - FABRICATING THE STEM WITH THIN METAL WALLS USING PRINTED CIRCUIT FEED THROUGH WILL REDUCE THE DEFECTS IN PRODUCTION AND DECREASE COST.

(9220) TITLE - THERMAL WEAPONS SYSTEM (TWS) ELECTRONICS, PHASE I

225

PROBLEM - HIGH DENSITY, HIGH RELIABILITY CIRCUIT CHIPS NEEDED BY THE TWS PROGRAM ARE NOT NOW AVAILABLE.

SOLUTION - ESTABLISH MANUFACTURING TECHNIQUES TO PRODUCE RELIABLE HIGH YIELD, HIGH DENSITY CHIPS OF THE TYPE NEEDED BY THE TWS PROGRAM.

COMPONENT --- LASER

(5066) TITLE - 1 TO 3 MICRON AVALANCHE DETECTORS

470

PROBLEM - MANUF. COSTS, VOLUME PROD. TECHNIQUES AND RELIABILITY HAVE TO BE ADDRESSED.

SOLUTION - ESTABLISH MANUFACTURING CAPABILITY FOR VOLUME PRODUCTION OF RELIABLE, LOW COST 1-3 MICRON AVALANCHE DETECTORS.

COMPONENT --- NUCLEAR

(2000) TITLE - RADIATION HARDNESS ASSURANCE TEST FOR MOS DEVICES

700

PROBLEM - MOS INTEGRATED CIRCUITS MUST WITHSTAND RADIATION DOSAGES, AND SO MUST UNDERGO RADIATION TESTING. TESTING SHOULD PREFERABLY BE DONE ON THE VENDOR'S ASSEMBLY LINE, WITHOUT THE USE OF COSTLY RADIATION EQUIPMENT.

SOLUTION - USE THE FIELD INDUCED INJECTION AND IMPACT IONIZATION (F4I) TEST. THIS PURELY ELECTRICAL TEST IS A GOOD INDICATOR OF RADIATION RESPONSE. USING NO RADIATION, IT WILL REDUCE THE COST OF THE TEST EQUIPMENT AND TESTING OPERATIONS.

FUNDING (\$\$\$\$)

PRIOR 82 83 84 85 86

COMPONENT -- PHOTO/OPTICAL

(5067) TITLE - UNIVERSAL INTEGRATED OPTICS MODULE

700

PROBLEM - PRESENT INTEGRATED OPTICS DEVICES ARE COMPOSED OF SEPARATE LIGHT SOURCE, PROCESSOR AND DETECTOR. IT IS POSSIBLE TO COMBINE THESE COMPONENTS ON A SINGLE CHIP. FABRICATION METHODS AND RELIABILITY HAVE TO BE IMPROVED.

SOLUTION - DEV. FABR. METHODS FOR OPTIMUM INTERFACE OF LIGHT SOURCE AND DETECTOR WITH ACOUSTO-OPTIC DEVICES.

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\* C A T E G O R Y \*  
\*-----\*  
\* DISPLAYS \*  
\*\*\*\*\*

COMPONENT -- CRT

(3505) TITLE - HIGH CONTRAST CATHODE RAY TUBE

350 309

PROBLEM - HIGH CONTRAST CRT AVIATION DISPLAYS FOR DAY-NIGHT NIGHT VISION GOGGLES ARE CURRENTLY UNAVAILABLE. OPTICAL FILTERS ARE ENVIRONMENTALLY LIMITED FOR THIS APPLICATION. PHOSPHOR TECHNIQUES ARE AVAILABLE BUT OPTIMIZATION AND ECONOMICS HAVE NOT BEEN SHOWN.

SOLUTION - USE OF OPTIMIZED BILAYER TRANSPARENT PHOSPHORS WITH A BLACK ABSORBENT LAYER PROVIDES THE HIGH CONTRAST DISPLAY FOR THE SEVERAL MODES. OPTIMIZATION OF PHOSPHOR TECHNIQUES FOR 5 IN AND LARGER CRTS WILL BE ECONOMICALLY JUSTIFIED.

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\* C A T E G O R Y \*  
\*-----\*  
\* ELECTRON TUBES \*  
\*\*\*\*\*

COMPONENT -- BEAM

(5010) TITLE - BONDED GRID CONVERGENT ELECTRON GUN

857

PROBLEM - PRESENT TECHNOLOGY CAN NOT BE USED TO BUILD GRIDED MILLIMETER WAVE TUBES. MUST USE HIGH VOLTAGE MODULATOR FOR PULSED OPERATION.

SOLUTION - THE PROCESSES OF CHEMICAL VAPOR DEPOSITION OF BUKON NITRIDE, GRID FABRICATION AND BONDING OF GRIDS TO THE CATHODE BY LOW COST PRODUCTION TECHNIQUES WILL BE DEVELOPED.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- BEAM

(CONTINUED)

(5019) TITLE - LASER-CUT SUBSTRATES FOR MW TUBES

441

PROBLEM - PRESENT CFA JAMMER TUBES EMPLOY HIGH COST, PRECISION ANODE CIRCUITS LIMITING UTILIZATION IN OPTIMIZED EW SYSTEMS. HIGH PERFORMANCE AND LOW WEIGHT AT MINIMUM COST IS REQUIRED TO FIELD DESIRED EW SYSTEMS.

SOLUTION - UTILIZE LASER-CUT ANODE CIRCUIT SUBSTRATES TO ACHIEVE DESIRED RF PERFORMANCE AND MINIMIZE PARTS AND OVERALL DEVICE COST. ALSO EMPLOY PHOTOLITHOGRAPHIC TECHNIQUES TO FORM MEANDERLINE CIRCUIT. USE BERYLLIA SUBSTRATE MATERIAL FOR DIELECTRIC SUPPORTS.

COMPONENT -- CATHODE

(5111) TITLE - VAPOR ORGANIC METALLIC EPITAXIAL GROWTH PROCESS

650

PROBLEM - LIQUID EPITAXIAL GROWTH PROCESS REQUIRES- A) LARGE AND COSTLY HIGH TEMP REACTORS, B) LARGE QUANTITIES OF SATURATION MELT MATERIALS, C) COSTLY QUALITY GALLIUM ARSENIDE SUBSTRATES, D) LENGTHY OPERATION PROCESS PER SINGLE GROWTH.

SOLUTION - THE VAPOR-ORGANIC-METALLIC PROCESS WILL ENABLE MINIMUM FACILITATION REQUIREMENTS, USE OF CONTROLLED GASES REQUIRING NO MELT MATERIALS, POSSIBLE USE OF LESS EXPENSIVE SUBSTRATES, AND MULTIGROWTH PRODUCTION ORIENTED PROCESS.

(5218) TITLE - HIGH CURRENT DENSITY CATHODES

475

PROBLEM - CATHODES OPERATING AT 8A/SQ CM AT 1025 DEG C OPERATING TEMP FOR 2000+ HOURS OF LIFE W/D EMISSION DEGRADATION ARE NOT AVAILABLE. MICROWAVE/MILLIMETER WAVE DEVICES USING STATE-OF-THE-ART CATHODES HAVE SHORT LIVES.

SOLUTION - PROVIDE MANUFACTURING PROCESS FOR HIGH CURRENT DENSITY CATHODES WHICH AT THE REQD 8A/CM DENSITY HAVE OVER TEN TIMES THE LIFE OF PRESENTLY AVAILABLE CATHODES.

COMPONENT -- MAGNETRONS

(5219) TITLE - MAGNETRONS FOR SECONDARY EMITTERS

400

PROBLEM - THESE DEVICES HAVE HIGH THERMAL DISSIPATION REQMTS (HIGH PEAK AND MEAN POWER W/ LONG PULSE CAPABILITY). OTHER FACTORS- SIZE, WEIGHT, COST, RELIABILITY, AND REPRODUCIBILITY PRESENT PROBLEMS.

SOLUTION - ESTABLISH NEW MFG TECHNIQUES TO PRODUCE HIGH THERMAL CAPABILITY MAGNETRON RF POWER SOURCES FOR SECONDARY EMITTER APPLICATIONS. COMPUTER AIDED DESIGN AND NEW REFRACTORY MATERIALS WILL BE APPLIED.



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- OTHER

(5102) TITLE - HIGH COERCIVITY, HIGH ENERGY PRODUCT MAGNETS

700 744

PROBLEM - PRESENT RARE EARTH MAGNETS LIMIT TWT DESIGNS TO AN UPPER FREQUENCY OF 18GHZ. NEW TUBE DESIGNS FOR THE RANGE ABOVE 18 GHZ INTO THE MMWAVE RANGE REQUIRE NEW HIGHER COERCIVITY, HIGHER ENERGY PRODUCT MAGNETS NOT COMMERCIALY AVAILABLE IN THE USA.

SOLUTION - DEVELOP USA MANUFACTURING CAPABILITY FOR SAMARIUM-TWO COBALT METAL SUBSTITUENTS TO ENHANCE THE CUERCIVITY AND ENERGY PRODUCT

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\* C A T E G O R Y \*  
\*-----\*  
\*FACTORY MODERNIZATION \*  
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COMPONENT -- ELECTRONICS

(5196) TITLE - INDUSTRIAL PRODUCTIVITY IMPROVEMENT (ELECTRONICS)

1500

PROBLEM - MANY ELECTRONICS ITEMS PRODUCED FOR ARMY ARE BUILT IN FACTORIES NOT USING MODERN METHODS AND EQUIPMENT, AUTOMATIC MATERIALS HANDLING SYSTEMS, OR COMPUTERIZED MANAGEMENT INFORMATION SYSTEMS. THESE PLANTS MUST BE UPDATED TO IMPROVE PRODUCTIVITY.

SOLUTION - ANALYZE A CONTRACTORS FACILITY, EVALUATING BOTH MANUFACTURING TECHNIQUES AND MANAGEMENT SYSTEMS. INCLUDE MATERIALS HANDLING, LAYOUT, INVENTORY CONTROL, LAM, PRODUCTION EQUIPMENT, AND MIS. IDENTIFY NEW METHODS, EQUIPMENT. DEVELOP A CAPITAL ACQ. PROG.

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\* C A T E G O R Y \*  
\*-----\*  
\*FREQUENCY CONTROL \*  
\*\*\*\*\*

COMPONENT -- CRYSTALS

(5069) TITLE - FABRIC OF OVERTONE MINIATURE PRECISION CRYSTALS

300

PROBLEM - MINIATURIZED PRECISION QUARTZ CRYSTALS IN MICROCIRCUIT PACKAGES ARE FRAGILE AND DIFFICULT TO FABRICATE.

SOLUTION - IMPROVE PRODUCTION TECHNIQUES FOR MINIATURE OVERTONE QUARTZ CRYSTALS THROUGH BETTER POLISHING, HANDLING, MOUNTING/BUNDING AND PACKAGING TECHNIQUES.

FUNDING (\$DDD)

PRIOR 82 83 84 85 86  
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COMPONENT -- CRYSTALS

(CONTINUED)

(5134) TITLE - HIGH PURITY LOW DISLOCATION QUARTZ

PROBLEM - COMMERCIALLY AVAILABLE QUARTZ CONTAINS IMPURITIES AND DISLOCATIONS WHICH MAKE THE MATERIAL UNSUITABLE FOR RESONATORS TO BE USED IN SPREAD SPECTRUM SYSTEMS. THIS IS ESPECIALLY TRUE IN RADIATION ENVIRONMENTS.

SOLUTION - ESTABLISH A CAPABILITY FOR MANUFACTURING HIGH PURITY AND LOW DISLOCATION DENSITY QUARTZ.

4DD

COMPONENT -- OSCILLATORS

(5083) TITLE - MINIATURE MOLECULAR FREQUENCY STANDARDS/CLOCKS

PROBLEM - OPTIMALLY JAM AND SPOOF RESISTANT SIGNAL STRUCTURES CANNOT BE USED IN TACTICAL SYSTEMS BECAUSE PRECISION CLOCKS WITH THE REQUIRED ACCURACIES, SIZE AND POWER CONSUMPTION REQUIRED FOR HIGHLY MOBILE USER UNITS DO NOT EXIST

SOLUTION - PROVIDE PRODUCTION SOURCES FOR MINIATURE (APPROX. 4D CUBIC INCHES) MOLECULAR FREQUENCY STANDARDS/CLOCKS CAPABLE OF PROVIDING MICROSECOND TIMEKEEPING FOR AT LEAST 24 HOURS INTACTICAL ENVIRONMENT

8DO

(5133) TITLE - STANDARD FREQUENCY/TIME MODULES

PROBLEM - USER ELEMENTS IN MOST MODERN C3 AND PUS/NAV SYSTEMS REQUIRE PRECISION CLOCKS THAT NEED TO BE SYNCHRONIZED AT MISSION START TO MASTER TIMING UNITS. SYSTEM SPECIFIC MASTER TIMING UNITS ARE COST INEFFICIENT, REQUIRING SEVERAL DIFFERENT MODULES AT A BASE

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR A UNIVERSAL TIMING MODULE CAPABLE OF SERVING USER UNITS OF A VARIETY OF DIFFERENT C3 AND POS/NAV SYSTEMS WITH PRECISE SYNC DATA.

4DO

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\* C A T E G O R Y \*  
\*-----\*  
\*GENERAL\*  
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COMPONENT -- COMPONENTS

(5107) TITLE - MILLIMETER WAVE POWER SOURCE COMBINER

PROBLEM - DIODE PARAMETERS VARY GREATLY FROM UNIT TO UNIT. PACKAGING METHODS ARE UNSATISFACTORY FOR COMBINER CIRCUITS. TUNING COMBINER ELEMENTS AND ADJUSTING ASSOCIATED MODULATING CIRCUITS TAKES WEEKS OF EFFORT TO OBTAIN REQUIRED PERFORMANCE LEVELS.

SOLUTION - OPTIMIZE FABRICATION PROCESS AND ESTABLISH TECHNIQUES OF DIODE AND PACKAGE PRODUCTION RESULTING IN HIGH YIELDS OF REPRODUCIBLE COMBINER USABLE DEVICES. OPTIMIZE COMBINER CIRCUITS AND MODULATORS FOR HIGH PERFORMANCE AND UNCOMPLICATED TUNINGS.

1179

FUNDING (\$D00)

PRIOR 82 83 84 85 86

COMPONENT -- COMPONENTS

(CONTINUED)

(5108) TITLE - LOW COST PRECISION MICROWAVE PHASE SHIFTER

PROBLEM - MODERN LOW SIDE LOBE PHASED ARRAY ANTENNAS REQUIRE PRECISION PHASE SHIFTERS. PRESENTLY PRECISION PHASE SHIFTERS ARE TOO EXPENSIVE BECAUSE OF THE LARGE AMOUNT OF LABOR REQUIRED TO ACHIEVE THE DESIRED PERFORMANCE

SOLUTION - SOLUTION IS TO REDUCE PHASE SHIFTER AND ITS DRIVER CIRCUITRY COST THROUGH AUTOMATION OF ASSEMBLY TECHNIQUES, ACTIVE MICROWAVE PHASE TRIMMING AND TESTING OF THE PHASE SHIFTER.

COMPONENT -- MISCELLANEOUS

(5017) TITLE - NON-HERMETIC HYBRID MICROCIRCUITS

PROBLEM - SEALED CHIP TAPE CARRIER TECHNIQUES OFFER LOW COST ASSEMBLY AND ENVIRONMENTAL PROTECTION OF INTEGRATED CIRCUIT CHIPS ON HYBRID MICROCIRCUITS. SIMILAR TREATMENT OF DISCRETE TRANSISTOR AND DIODE CHIPS IS NOT ECONOMICALLY FEASIBLE.

SOLUTION - ESTABLISH PRODUCTION TECHNIQUES FOR SEALING AND HANDLING DISCRETE SEMICONDUCTOR DEVICE CHIPS INCLUDING TESTING AND BONDING OF CHIPS TO HYBRID MICROCIRCUITS.

(5297) TITLE - SAW DEVICES WITH SUB-MICRON ELECTRODES

PROBLEM - QUANTITY PDM CAPABILITY FOR SURFACE ACOUSTIC WAVE (SAW) DEVICES, WHICH USE TRANSDUCER GEOMETRIES WITH MICRON OR SUBMICRON ELECTRODE DIMENSIONS, DOES NOT EXIST. SAW DEVICES ARE CURRENTLY A PRODUCT OF A HIGHLY SKILLED R+D GROUP.

SOLUTION - OPTIMIZE E-BEAM PHOTOLITHOGRAPHIC PROCEDURES TO MAKE THEM AVAILABLE AS QUANTITY PRODUCTION TOOLS. DEMONSTRATE PILOT PDM FOR SAW DEVICES W/ REQD ELECTRODE DIMENSIONS ON PIEZOELECTRIC SUBSTRATES.

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\* C A T E G O R Y \*  
\*-----\*  
\*INTEGRATED ELECTRONICS \*  
\*\*\*\*\*

COMPONENT -- CIRCUITRY

1386

100 350

500

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- CIRCUITRY

(CONTINUED)

(5001) TITLE - SOLID STATE SCAN CONVERTER COPLANAR MICROELECTRONICS

950

PROBLEM - HIGH PERFORMANCE FLIR'S WITH REMOTE TV COMPATIBLE DISPLAYS REQUIRE SOLID STATE SCAN CONVERTERS FOR SIGNAL PROCESSING. CURRENT PRINTED CIRCUIT BOARD TECHNOLOGY PREVENTS IMPLEMENTATION OF THESE ELECTRONICS INTO HIGH DENSITY PACKAGES.

SOLUTION - UTILIZE A 3 DIMENSIONAL MICROELECTRONIC INTERCONNECTION TECHNOLOGY AIMED AT HIGH PRODUCTION VOLUME WHERE LOW UNIT COST, HIGH DEVICE DENSITY, GOOD POWER DISSIPATION, HIGH LOGIC SPEED AND LOW EMI SUSCEPTIBILITY ARE DRIVING REQUIREMENTS.

(5132) TITLE - VHSIC FABRICATION USING ELECTRON BEAM TECHNOLOGY

500

PROBLEM - SUBMICRON INTEGRATED CIRCUIT FABRICATION METHODS HAVE BEEN DEVELOPED FOR DEVICES HAVING CONDUCTIVE SILICON SUBSTRATES, OTHER CHOICES OF LOW CONDUCTIVITY SUBSTRATES CANNOT BE USED BECAUSE PROCESS CONDITIONS HAVE NOT BEEN DEVELOPED.

SOLUTION - USING SILICON ON SAPPHIRE OR GALLIUM ARSENIDE SUBSTRATES SUBMICRON INTEGRATED CIRCUIT DEVICE PRODUCTION PROCESSES WILL BE DEVELOPED INCORPORATING DIRECT WRITE ELECTRON BEAM PATTERNING

(5137) TITLE - FABRICATION TECHNIQUES FOR HIGH SPEED VHSIC

850

PROBLEM - R AND D DESIGNS OF VHSIC MODULES ARE ENCOUNTERING YIELD PROBLEMS AFTER TRANSFER TO PRODUCTION LINES. HIGH DENSITY OF CIRCUITS IS NOT COMPATIBLE WITH EXISTING IN-PROCESS SCREENING AND PROCESS CONTROL METHODS.

SOLUTION - VHSIC CHIP WILL BE SUBJECTED TO DESIGN INTERACTIONS AND PROCESS CHANGES TO MAKE CIRCUITS PRODUCIBLE IN PRODUCTION LINE AND IMPROVE YIELDS. HIGH SPEED TEST METHODS WILL DEVELOP TO REDUCE COST OF PRODUCTION SCREENING

(5168) TITLE - AUTOMATIC RETICLE INSPECTION SYSTEM, PHASE I

480 500

PROBLEM - THERE IS NO WAY TO CHECK TAPE-GENERATED RETICLE PATTERNS AGAINST THE COMPUTER-GENERATED MASTER TAPE. VISUAL INSPECTION OF RETICLES FOR PINHOLES OR DUST PARTICLES IS VERY DIFFICULT.

SOLUTION - USE PATTERN RECOGNITION EQUIPMENT TO COMPARE THE RETICLE PATTERN WITH THE ORIGINAL COMPUTER OUTPUT. MAKE A RECORD OF DEFECTS THAT WILL PERMIT REPAIR OF THE RETICLE.

(9905) TITLE - LOW COST MONOLITHIC GALLIUM ARSENIDE MW INTEG CKTS

1179

PROBLEM - SIZE WEIGHT COST CONSTRAINTS LIMIT APPLICATION OF MICROWAVE ICs FOR MANY SYSTEMS APPLICATIONS. DRAMATIC REDUCTIONS PARTICULARLY COST ARE POTENTIALLY AVAILABLE ALONG WITH ORDER OF MAGNITUDE RELIABILITY IMPROVEMENT.

SOLUTION - ESTABLISH PRODUCTION CONTROLS FOR BATCH FABRICATION OF GALLIUM ARSENIDE MONOLITHIC CIRCUIT FUNCTIONS DRAW ON PRIOR R+D AND MMT EFFORTS IN E-BEAM, ION IMPLANT, AND VAPOR EPI TO FULLY AUTOMATE PRODUCTION OF AMPLIFIER AND RECEIVER FUNCTIONS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- GUIDANCE SYSTEM

(5195) TITLE - VHSIC CMOS/SOS DIGITAL CORRELATOR

900

PROBLEM - 8-CHANNEL CORRELATORS IN CMOS/SOS TECHNOLOGY ARE HIGH COST AND AVAILABILITY IS LIMITED.

SOLUTION - ESTABLISH A SECOND SOURCE BY TRANSFERRING FULL TECHNOLOGY, INCLUDING PATTERN DATA TAPES FROM PRIME VHSIC CONTRACTOR.

(5212) TITLE - MICROELECTRONIC PACKAGES FOR VHSIC

600

PROBLEM - THE PRODUCTIVITY OF CERAMIC PACKAGES WITH HIGH TERMINAL COUNTS LEADING TO POOR YIELDS AND HIGH PACKAGE COST

SOLUTION - UNDER FY80 R+D, AN ATTEMPT TO ADVANCE CERAMIC PROCESSING TECHNIQUES AND RELATED MFG CONTROLS IS BEING MADE TO IMPROVE POOR MULTILAYER FINE PITCH PACKAGE YIELDS. THIS MMT EFFORT WILL TRANSLATE THOSE TECHNIQUES TO THE MANUFACTURING MODE.

(5213) TITLE - PRECISION HIGH-QUALITY VHSIC X-RAY MASKS

388

PROBLEM - MASK MEMBRANES FOR X-RAY LITHOGRAPHY OF VHSIC CHIPS ARE HIGH IN COST AND LACK GOOD, QUICK RESPONSE AND STABILITY.

SOLUTION - DEVELOP PROCEDURES, METHODS AND FABRICATION STEPS TO PRODUCE LOW-COST, STABLE AND DURABLE X-RAY MASKS AND MASK MEMBRANES.

(5214) TITLE - HIGH SPEED D/A CONVERTER FOR VHSIC E-BEAM SYSTEM

450

PROBLEM - D/A CONVERTERS NEEDED FOR HIGH-SPEED VHSIC E-BEAM MACHINES ARE EXTREMELY HIGH IN COST AND HAVE VERY LIMITED AVAILABILITY.

SOLUTION - ESTABLISH A SOURCE FOR PRODUCING HIGH-SPEED D/A CONVERTERS AND DEVELOP QA PROVISIONS TO MEET MIL-STD ENVIRONMENTAL TESTS.

(5215) TITLE - HIGH-SPEED DIGITAL VHSIC MICROCIRCUITS

1000

PROBLEM - THE PROBLEM OF INSERTION OF VHSIC TECHNOLOGY INTO PLRS WILL BE ADDRESSED TO REDUCE BOTH COST AND SIZE OF THE EQUIPMENT.

SOLUTION - MULTILAYER PACKAGES ARE BEING DEVELOPED TO MAXIMIZE CIRCUIT PACKING AND INTERCONNECTION EFFICIENCY. SOURCES FOR PACKAGES TO HOUSE VHSIC CHIPS AND INTERCONNECTION BOARDS WILL BE ESTABLISHED TO REDUCE SIZE AND COST OF PLRS MODULES.

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\* C A T E G O R Y \*  
\*-----\*  
\*LASER\*  
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FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- GENERAL

(5113) TITLE - 10-MILRON PULSED WAVEGUIDE LASER

350

PROBLEM - PRESENTLY PULSED WAVEGUIDE CARBON DIOXIDE LASERS FOR USE AS SOURCES FOR MISSILE BEAMRIDERS AND BEACONS ARE FABRICATED IN SMALL QUANTITIES BY HIGHLY SKILLED PERSONS. ELECTRODES, MIRRORS, AND CERAMIC CAVITY HOUSING REQ. PRECISE FABRICATION AND ASSY.

SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.

(5135) TITLE - FAR INFRARED LASER JAMMER SOURCE

400

PROBLEM - CO2 LASER SOURCES MUST BE USED FOR OPTICAL COUNTERMEASURES AGAINST THERMAL IMAGES AND OTHER FIR DEVICES.

SOLUTION - DEVELOP COST-EFFECTIVE PRODUCTION TECHNIQUES.

(5136) TITLE - HIGH POWER, TUNABLE, LONG WAVELENGTH INJECTION LASER

600

PROBLEM - FEW PRODUCTION METHODS HAVE BEEN DEVELOPED FOR HIGH POWER INJECTION LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITIES FOR FABRICATING SINGLE AND STACKED INJECTION LASERS AT LONG WAVELENGTH FOR USE IN ADVANCED FIBER OPTICS COMMUNICATION, TRAINING DEVICES AND RANGEFINDERS.

(5222) TITLE - LONG LENGTH Nd/YAG BOULES

485

PROBLEM - HIGH QUALITY Nd/YAG BOULES ARE EXTREMELY DIFFICULT TO GROW EVEN AFTER TWO PREVIOUS MMT EFFORTS ATTEMPTED TO INCREASE YIELD, ROD SIZE AND ROD EXTRACTION.

SOLUTION - A NEW CRYSTAL GROWTH METHOD, VERTICAL SOLIDIFICATION OF MELT (VSM), PROMISES AN EFFICIENT, LOW COST SOLUTION TO THE SHORTAGE OF ROD MATERIAL. THIS PROCESS DEMONSTRATED IN THE LAB, NEEDS TO BE TRANSITIONED TO FULL PRODUCTION.

COMPONENT --- MATERIALS

(5122) TITLE - QUATERNARY INJECTION LASERS

400

PROBLEM - NO VOLUME PRODUCTION METHODS EXIST FOR PRODUCING TRAINING LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITY FOR INJECTION LASERS FROM VAPOR PHASE EPITAXY FABRICATION METHOD FOR USE IN FIBER-OPTIC COMMUNICATION DEVICES AND EYE-SAFE TRAINING DEVICES.



FUNDING (\$DOD)

PRIOR 82 83 84 85 86

COMPONENT -- MATERIALS

(CONTINUED)

(5200) TITLE - WIDE BAND TUNABLE LEAD-SALT INJECTION LASERS AND DETECTORS

214 463

PROBLEM - EXPECTED HIGH DEMAND FOR TUNABLE Pb-SALT DIODES + DETECTORS REQUIRES NEW TECHNIQUES FOR PRODUCING HIGH QUANTITY, QUALITY ITEMS. COMMERCIAL DIODES ARE MADE BY DIFFUSION TECHNIQUES EVEN THOUGH LPE GROWN DIODES EXHIBIT BETTER PERFORMANCE PARAMETERS.

SOLUTION - SELECT SUBSTRATE GROWTH TECHNIQUE TO PRODUCE LARGE BOULES THAT HAVE LOW IMPURITY DENSITY AND UNIFORM CONCENTRATION GRADIENT. ESTABLISH LPE GROWTH AND MONOLITHIC MATERIALS PROCESSING TECHNIQUES USEFUL TO FABRICATE LASER ARRAYS.

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\* C A T E G O R Y \*  
\*-----\*  
\*OPTICS\*  
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COMPONENT -- LENSES

(5192) TITLE - THERMAL WEAPONS SYSTEM (TWS) IR OPTICS - PHASE 1

165 385

PROBLEM - IR OPTICS FOR TWS WILL CONTAIN SEVERAL ELEMENTS WITH ASPHERIC SURFACES WHICH WILL PROBABLY BE MICKROMACHINED BY NC DIAMOND CUTTING TOOLS. PRESENT METHOD TURNS ONE SURFACE ON ONE ELEMENT AT A TIME. THIS IS EXPENSIVE.

SOLUTION - DETERMINE MINIMUM TOLERANCES REQUIRED AND DEVELOP EQUIPMENT AND PROCESSES TO FABRICATE A PLURALITY OF LENS SURFACES SIMULTANEOUSLY. ALSO DEVELOP PRODUCTION QUANTITY TEST AND ACCEPTANCE TECHNOLOGY.

COMPONENT -- MISCELLANEOUS

(5024) TITLE - BROADBAND MID INFRARED SOURCE

250

PROBLEM - UNIQUE GEOMETRICAL SHAPES MUST BE FABRICATED AND ASSEMBLED IN SOURCE PRODUCTION. HIGH COST RESULTS FROM EXTENSIVE MANUAL LABOR CONTENT. THE TECHNIQUE FOR PRODUCING THE REFRACTORY EMITTER MATERIAL IS MARGINAL IN MATERIAL REPRODUCIBILITY.

SOLUTION - ESTABLISH AUTOMATED TECHNIQUE FOR PRODUCING EMITTER AND HEATER ELEMENTS. ESTABLISH CONTROL OF PROCESS PARAMETERS THAT WILL RESULT IN IMPROVED YIELD OF REFRACTORY EMITTER.

(5082) TITLE - INTEGRATED OPTICS BUILDING BLOCK - PHASE 1

300

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

FUNDING (\$DOD)

PRIOR 82 83 84 85 86

COMPONENT --- MISCELLANEOUS

(CONTINUED)

(5087) TITLE - INTEGRATED OPTICS BUILDING BLOCK - PHASE II

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

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\* C A T E G O R Y \*  
\*-----\*  
\*PASSIVE COMPONENTS \*  
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COMPONENT --- MISCELLANEOUS

(5109) TITLE - ULTRAWIDE BANDWIDTH SAW DELAY LINES

PROBLEM - BROADBAND SAW DELAY LINES ARE REQUIRED FOR SIGNAL STORAGE DEVICE  
BANDWIDTH IS FIXED BY NEED TO STORE SIGNALS FOR A TEN MICROSECOND DURATION  
FOR SIGNALS RANGING OVER 500 MHZ BAND. DEVICE INSERTION LOSS AND MULTIPLE  
TRANSMIT REFLECTIONS MUST BE MINIMAL

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR SAW DELAY LINES OPERATING AT  
1GHZ USING IDENTICAL BROADBAND, NON-PERIODIC INTERDIGITAL TRANSDUCERS ON  
LITHIUM NIOBATE SUBSTRATES. HIGH RESOLUTION PHOTOLITHOGRAPHIC FABRICATION  
WILL USE DIRECT PROJECTION PRINTING.

(5186) TITLE - LOW COST MILLIMETER WAVE FERRITE ISULATOR

PROBLEM - LACK OF VOLUME PRODUCTION TECHNIQUES FOR FERRITE ISULATORS CAUSES  
THEIR PRICE TO BE HIGH. FERRITE RODS ARE GROUND BY HAND AND SMALL METAL  
HOUSINGS ARE MACHINED. PARTS MUST BE FITTED TOGETHER AND TESTED AT HIGH  
FREQUENCY.

SOLUTION - USE REFRACTORY GRINDING METHODS TO FURN RODS OR PUCKS OF SINTERED  
FERRITE MATERIAL. USE NC MACHINING OF A LUMINUM DIE CAST HOUSINGS. FURNACE  
BRAZE CONNECTORS AND MOUNTINGS. TEST AUTOMATICALLY.

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\* C A T E G O R Y \*  
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\*POWER SOURCES \*  
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596

696

65D

PRIOR	82	83	84	85	86
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## COMPONENT -- BATTERIES

## (5162) TITLE - EXJAM BATTERY MANUFACTURING TECHNOLOGY, PHASE I

PROBLEM - PRESENT R AND D MODELS OF UNATTENDED EXPENDABLE JAMMER RESERVE POWER SUPPLY (UEJPS) ARE HAND MADE 1 OR 2 AT A TIME. UNLESS FABRICATION/ASSEMBLY ARE PRODUCTION ENGINEERED, LABOR COSTS WILL MAKE THE BATTERY PROHIBITIVELY EXPENSIVE.

SOLUTION - EVALUATE THE VARIOUS STEPS IN FABRICATION/ASSEMBLY FOR UEJPS HOW BEST TO MAKE IN HIGH VOLUME. DESIGN, BUILD AND VALIDATE PROTOTYPE TOOLING AND MACHINERY FOR CONVERTING TO HIGH VOLUME PRODUCTION.

## COMPONENT -- CELLS

## (5210) TITLE - HIGH ENERGY RECHARGEABLE LITHIUM CELLS

PROBLEM - PRESENT RECHARGEABLE LITHIUM CELLS ARE MANUFACTURED TO REQD SPECS BUT LABORATORY HAND METHODS ARE USED FOR CATHODE FAB, ASSY, CLOSURE AND FILLING. 10 MH PER CELL IS REQD. A DRY ROOM ENVIRONMENT AND PURE, HIGH QUALITY COMPONENTS ARE NEEDED.

SOLUTION - DESIGN AND BUILD A MFG FACILITY CAPABLE OF 840 RLB CELLS PER 8 HOUR SHIFT (LT 1 MH PER CELL) - PRODUCE CELLS IN 2.5 AND 6.0 AH SIZES, ASSEMBLE THEM INTO BATTERIES AND VERIFY TO SPECS BY FIRST ARTICLE AND PDN LOT TESTING.

## (5211) TITLE - IMPROVED, HIGH CAPACITY BATTERY BA-5598/U AND BA-5590/U

PROBLEM - HIGH RATE PDN TECHNIQUES ARE NEEDED FOR LITHIUM THIIONYL CHLORIDE (LTC) BATTERIES. THE LTC BATTERY WILL BE IN PRISMATIC FORM VERSUS A CYLINDER. THE ONLY AVAILABLE PDN LINES WILL BE PILOT TYPES WHICH WILL RESULT IN HIGH UNIT COSTS.

SOLUTION - THIS PROJECT WILL ESTABLISH TECHNIQUES TO ASSEMBLE LTC CELLS AND FABRICATE BATTERIES FROM THEM. THIS INCLUDES CELL AND BATTERY ASSY, INTRA-CELL ELECTRODE CONTACTS, ELECTRODE FORMATION, HANDLING AND CAKE AND LIQUID FILLING.

## COMPONENT -- MISCELLANEOUS

## (5037) TITLE - TWO MEGAWATT HIGH ENERGY LASER SWITCH

PROBLEM - PROPOSED MILITARY DIRECTED BEAM WEAPONS WILL REQUIRE MULTIMEGAWATT AVERAGE PULSED POWER TO OPERATE DELIVERY SYSTEM.

SOLUTION - PRODUCE TWO MEGAWATT PULSE MODULES WHICH WILL CONVERT THE INCOMING MEGAWATTS OF DC POWER INTO HIGH ENERGY PULSES. MODULES COULD BE STACKED TO MEET THE PARTICULAR SYSTEM NEEDS.

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 \* C A T E G O R Y \*  
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 \*SOLID STATE\*  
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FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- DELAY LINES

(5174) TITLE -- AUTOMATIC SPUTTERING PROCESS CONTROL F/PRODUCING ZNO PHASE 1

292 280

PROBLEM -- GAS MIXTURE, ZNO PURITY ? SPUTTERING PARAMETERS ARE MANUALLY MONITORED USING A MASS ANALYZER. CORRECTIONS IN FLOW ? DEPOSITION PROCESSES ARE SLOW AND PERFORMED AFTER OCCURRENCE.

SOLUTION -- LATEST STATE-OF-THE-ART MASS ANALYSIS EQUIPMENT WILL BE COMPUTER/MICROPROCESSOR COUPLED TO THE PROCESSING EQUIPMENT USED FOR FABRICATING ZNO DELAY LINES. VACUUM DEPOSITION AND GAS FLOW RATES WILL BE OPTIMIZED.

COMPONENT -- DIODES/RECTIFIERS

(3011) TITLE -- MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES

1179

PROBLEM -- INADEQUATE CONTROL OF EPI MATERIAL AND DEVICE PROCESSING STEPS REQUIRING CLOSE TOLERANCES FOR EFFICIENT MM OPERATION RESULTS IN LOW YIELD POOR UNIFORMITY AND HIGH UNIT COST FOR MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES.

SOLUTION -- PRODUCTION ENGINEERING IN EPITAXIAL MATERIAL PREPARATION, INJECTION-LIMITED CONTACT FORMATION, INTEGRAL HEAT SINK TECHNOLOGY AND PACKAGING WILL ESTABLISH MANE TECHNIQUES AND CONTROLS RESULTING IN A COST REDUCTION OF MORE THAN TEN TO ONE.

COMPONENT -- MISCELLANEOUS

(5053) TITLE -- MILLIMETER-WAVE INTEGRATED CIRCUIT TRANCEIVERS

500 1000

PROBLEM -- MILLIMETER WAVE DIELECTRIC WAVEGUIDE INTEGRATED TRANSCEIVER MODULES IN THE 90 TO 220 GHZ REGION ARE DIFFICULT TO FABRICATE AND LIMITED IN PERFORMANCE. REPRODUCIBLE HIGH PERFORMANCE CHARACTERISTICS ARE DIFFICULT TO ACHIEVE WITH PRESENT DESIGN.

SOLUTION -- ESTABLISH IMPROVED DESIGN TECHNIQUES FOR INTEGRATED MILLIMETER WAVE DIELECTRIC WAVEGUIDE STRUCTURES SO THAT RELIABLE, HIGH PERFORMANCE TRANSCEIVER MODULES CAN BE FABRICATED IN LARGE QUANTITIES AT MINIMUM COST.

COMPONENT -- TRANSISTORS

(5054) TITLE -- MONOLITHICALLY MATCHED POWER GA-AS FETS

800

PROBLEM -- GAAS MICROWAVE POWER FETS REQUIRE LARGE GATE WIDTHS TO ACHIEVE HIGH OUTPUT POWER LEVELS LOW TERMINAL IMPEDANCES ACCOMPANY THE LARGE GATE WIDTHS AND ADVERSELY EFFECT A DEVICES BANDWIDTH CAPABILITY AND OVERALL RF PERFORMANCE.

SOLUTION -- ESTABLISH PRODUCTION TECHNIQUES TO FABRICATE MONOLITHIC MATCHING CIRCUITS FOR POWER COMBINING A NUMBER OF SMALLER GATE WIDTH CELLS RESULTING DEVICES WILL HAVE HIGH USABLE TERMINAL IMPEDANCES AND INTRINSIC DEVICE RF PERFORMANCE WILL BE PRESERVED.

FUNDING (\$000)

	82	83	84	85	86
PRIOR					

(CONTINUED)

COMPONENT -- TRANSISTORS

(5075) TITLE - MICROWAVE SILICON FETS

PROBLEM - HIGH PERFORMANCE MICROWAVE SILICON FETS REQUIRE GRADED EPITAXIAL  
DOING PROFILES. HIGH YIELD DEMANDS GREATER PROCESS CONTROL.

SOLUTION - PROCESSES FOR ACCURATELY CONTROLLING THE GROWTH OF GRADED EPITAXIAL  
SILICON MATERIAL WILL BE ESTABLISHED.

800





<u>CATEGORY</u>	<u>PAGE</u>
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## US ARMY MATERIALS AND MECHANICS RESEARCH CENTER

(AMMRC)

The Army Materials and Mechanics Research Center (AMMRC) is designated the DARCOM Lead Laboratory for Materials Testing Technology. In this role, AMMRC is responsible for management and direction of the DARCOM materials testing technology activities and formulation of the Materials Testing Technology (MTT) Program. This program formulation is accomplished by identifying and defining materials testing problem areas in response to system requirements of the DARCOM R&D and Readiness Commands and Project Managers utilizing materials testing technology. The Lead Laboratory mission also encompasses the advising and assisting of the major subordinate commands and Project Managers in the utilization of Materials Testing Technology in order to assure a smooth transition from the developmental to the production phases of the life cycle. Concurrent with the above responsibilities is the furnishing of technical assistance in the application of methods and techniques in solving material problems in connection with procured items.

The MTT Program has shown a steady growth over the last several years, from 2.5 million dollars in FY73 to 4.6 million dollars in FY82. This growth has been largely due to the increased participation in the Program by DARCOM Project Managers, as well as increased attention to the Program by DARCOM Quality Assurance managers. Another increasing trend within the MMT Program has also been the directing of more and more testing related projects to the MTT Program. Specific areas of effort are as follows:

### a. Automated Testing

One of the primary needs in NDT and in inspection in general is to remove the decision-making from the inspector where possible. In FY 80 and beyond efforts will be intensively directed toward providing engineering prototype systems utilizing automated decision-making. These include automated radiographic and ultrasonic techniques, optical/laser techniques, and computerized chemical analysis. The ultimate goal in all automated testing systems is the essential feedback to the total system for automated process control.

### b. Predictive Failure

The need for diagnostic measurement techniques for anticipation of catastrophic failure and for the measurement of remaining life, both in operating equipment and in units being overhauled and rebuilt, presents a tremendous opportunity for cost savings and reliability improvement. A principal thrust has come from the loss of diagnostics and in-situ measurements adjunct to non-destructive testing represents the real time use of NDT techniques with analysis and decision elements built in.

#### c. Materials

As the newer materials are utilized in major weapon systems, it is imperative that new and/or improved inspection techniques be available to measure characteristics or parameters to assure adequate and reliable performance. Of particular interest in the next five years are composites, elastomers, plastics, and ceramics, with continuing interest in metals and energetics (explosives, pyrotechnics, and propellants).

#### d. Techniques

Specifically covered in the objectives of the MTT Program is the investigation of specific physical principles which can potentially offer significant improvement in sensitivity, cost, portability, or speed, and combination of these. The development and application of techniques, such as ultrasonics, infrared, holography, spectroscopy, chromatography, etc, can significantly improve DARCOM materiel and offer substantial improvement in process control.

The MTT Program effected a test method categories classification change in FY 1980 to more accurately reflect certain current technology interests. Historically, the Program has always included the testing of electronic materials and materiel under one of three broad test method categories: nondestructive, chemical, or mechanical testing. However, electronic materials and materiel are often used in highly mission-critical applications and they usually employ and reflect advanced and sophisticated technologies, not only in their production but in their quality assurance inspection procedures. It was therefore determined that it would be in the best interest of the overall MTT Program to provide enhanced visibility to this highly relevant subject. Accordingly (starting in FY 1983), a fourth MTT test method category was established; namely, "Electronics".

**BARCOM**  
**C O M M A N D F U N D I N G S U M M A R Y**  
**(THOUSANDS)**

CATEGORY	FY82	FY83	FY84	FY85	FY86
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GENERAL	831	660	720	750	600
TESTING	4573	4551	5500	5500	6000
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TOTAL	5404	5211	6220	6250	6600

MMT FIVE YEAR PLAN  
RCS DRCMT 126

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\* C A T E G O R Y \*  
\*-----\*  
\*GENERAL\*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- MISCELLANEOUS

(5052) TITLE - ARMY ENGINEERING DESIGN HANDBOOK FOR PRODUCTION SUPPORT

2256 580 660 720 750 600

PROBLEM - TECHNICAL SCIENTIFIC AND ENGINEERING DATA IS CONTINALLY BEING GENERATED WITHIN THE ARMY AND NEEDS TO BE COLLECTED IN APPROPRIATE DOCUMENTS.

SOLUTION - INITIATE REVISE AND UPDATE DATA USED IN PRODUCTION OF MILITARY HARDWARE AND EQUIPMENT.

(6390) TITLE - PROGRAM IMPLEMENTATION AND INFORMATION TRANSFER

642 251

PROBLEM - THE SUCCESS OF THE MMT PROGRAM IS VERY DEPENDENT ON WHETHER THE RESULTS OF MMT WORK GET IMPLEMENTED. THIS IN TURN IS DEPENDENT ON WHETHER INFORMATION CONCERNING THE MMT TECHNOLOGY IS MADE AVAILABLE AND USED BY CONCERNED PARTIES.

SOLUTION - INSURE THAT THE MMT RESULTS ARE DOCUMENTED AND GIVEN WIDE DISTRIBUTION SO AS TO ENCOURAGE IMPLEMENTATION.

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\* C A T E G O R Y \*  
\*-----\*  
\*TESTING\*  
\*\*\*\*\*

COMPONENT --- CHEMICAL

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

3652 1113 611 600 600 600

PROBLEM - CURRENT LABORATORY METHODS FOR CHEMICAL TESTING ARE SPECIALIZED AND EXPENSIVE. REAL TIME TESTING TECHNIQUES ARE NEEDED TO CONTROL CHEMICAL PROCESSING.

SOLUTION - ADAPT QUICK RESPONSE CHEMICAL TESTING EQUIPMENT TO AUTOMATE THE CONTROL OF CHEMICAL PROCESSES.

COMPONENT --- ELECTRONICS

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

4790 730 1000 1000 1200

PROBLEM - ELECTRONIC ITEMS AND ANCILLARY DEVICES ARE AMONG THE MOST TECHNICALLY SOPHISTICATED AND MISSION-CRITICAL OF THE ARMY INVENTORY. CURRENT TESTING OF THESE ITEMS IS EQUALLY SOPHISTICATED, TIME-CONSUMING, AND DIFFICULT TO ADAPT TO PRODUCTION ENVIRONMENT.

SOLUTION - ADAPT CURRENT AND DEVELOPING STATE-OF-THE-ART TESTING TECHNIQUES TO SIMPLIFIED, RAPID INSPECTION SYSTEMS FOR UN-LINE REAL-TIME, PRODUCTION QUALITY ASSURANCE.

MMT FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$DDD)

PRIOR	82	83	84	85	86
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COMPONENT --- MECHANICAL

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

PROBLEM - METHODS OF MECHANICAL TESTING ARE BASICALLY TIME CONSUMING, LABORATORY TYPE OPERATIONS. THE TESTING IS OFTEN ULTIMATE AND THEREFORE DESTRUCTIVE OR IT TENDS TO INTRODUCE RESIDUAL STRESS/STRAIN IN THE TESTED ITEMS.

SOLUTION - ESTABLISH IMPROVED REAL-TIME INSPECTION TECHNIQUES TO REDUCE PRODUCTION BOTTLENECKS ASSOCIATED WITH MECHANICAL TESTING. ALSO, THE OPTIMUM TESTING CRITERIA WILL BE ESTABLISHED WHEN NECESSARY.

COMPONENT --- NON-DESTRUCTIVE TESTING

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

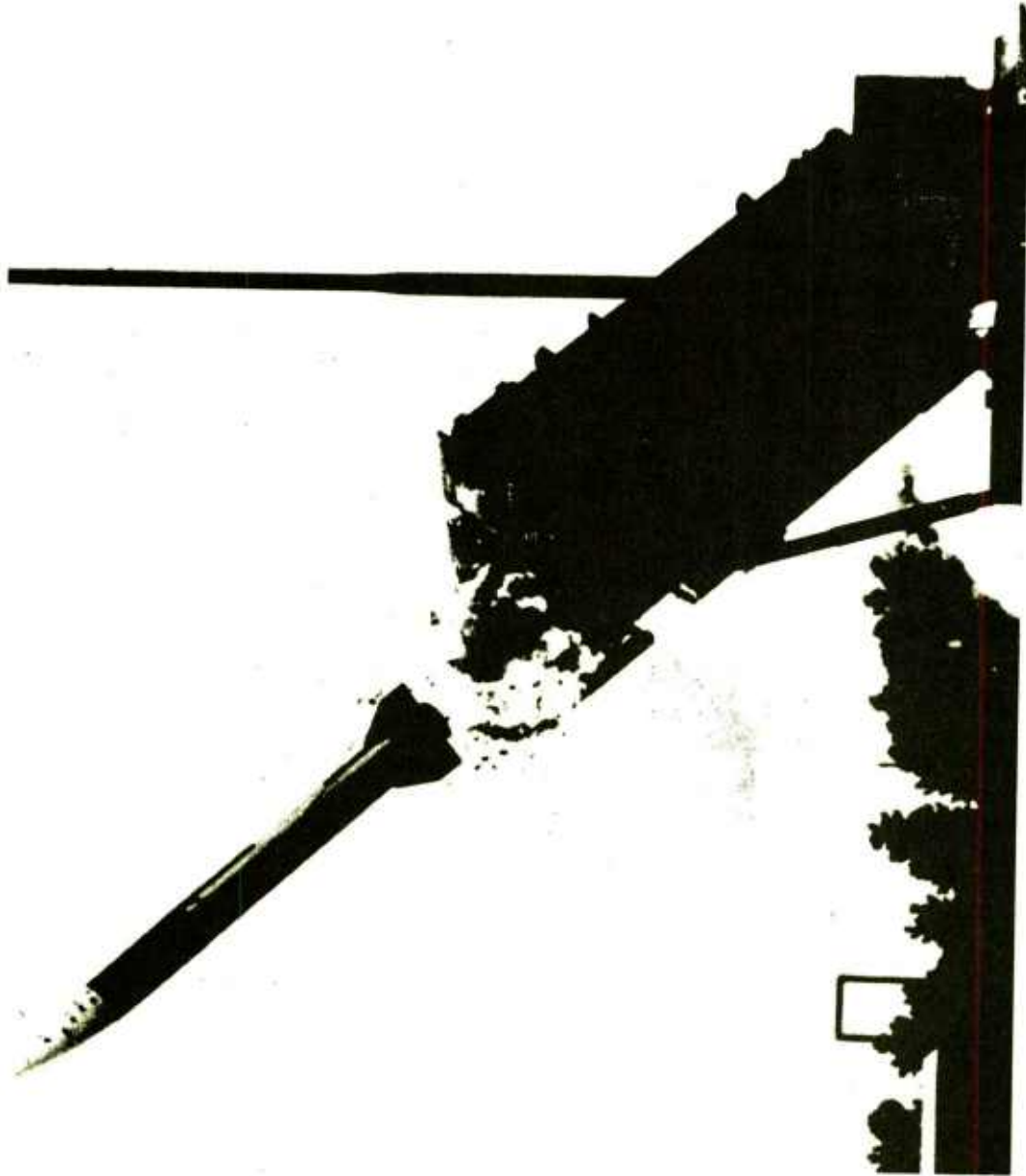
PROBLEM - DESTRUCTIVE AND CERTAIN CONVENTIONAL NON-DESTRUCTIVE TESTING TECHNIQUES ARE RESPECTIVELY UNSUITED AND INADEQUATE OR HARD TO BE ADAPTED TO ON-LINE PRODUCTION TESTING USAGE.

SOLUTION - DETERMINE FEASIBILITY OF ADAPTING LAB-PROVEN NDT METHODS OR MODIFY THE EXISTING TEST PROCEDURES FOR ON-LINE PRODUCTION QUALITY ASSURANCE TESTING.

15500	2500	2300	2900	2900	3200
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MISSILE COMMAND  
(MICOM)

<u>CATEGORY</u>	<u>PAGE</u>
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## US ARMY MISSILE COMMAND

### (MICOM)

The US Army Missile Command is located at Redstone Arsenal, AL, and is responsible for research, development, and acquisition of missile systems for the Army. Facilities include flight test ranges, laboratories, and a simulation center.

Major systems managed by special project offices include STINGER (Shoulder-Fired Air Defense Guided Missile), US ROLAND (All-Weather Air Defense Missile System), MLRS (Multiple Launched Rocket System), Viper (Short-Range Anti-Tank Weapon), HELLFIRE (Helicopter-Carried Air-To-Ground Missile), PERSHING (400-Mile Range Air-To-Ground Missile) and the 2.75 Inch Air-To-Ground Rocket. MICOM is also the Army's center for laser research and manages efforts to apply lasers in missile guidance and as weapons.

MICOM supports technological thrusts in the following electronics areas: (1) Manufacturing techniques for multiple chips employing multiple technologies that are projected to be in the mainstream of the semiconductor marketplace for many years to come. (2) Electronic computer-aided manufacturing and hybrid computer-aided design and manufacturing in order to automate microelectronic production lines and therefore improve productivity, increase fabrication speed and decrease unit cost. (3) Elimination of precious metals from military hybrid micro-circuits and their replacement with materials which are universally available and economically attractive.

A major thrust in MICOM's MMT Program is guidance systems. A large amount of this effort is planned for work on printed circuits and seekers. Efforts in the electronics area include projects on plated-through holes, thin foils, wave soldering, and cleanliness criteria. The seeker area includes work on infrared optics, radio frequency, and laser optics. Other work planned on guidance systems include projects for windows and radomes, optics, and hybrid circuits.

Another thrust area is missile structures, which includes projects for airframes using metal, plastic, or composites. Efforts for composite airframes will address filament winding, inner shell forming and missile substructures. New joining, machining, and forming technologies will be investigated and applied.

Propulsion system components such as motor cases, nozzles, and propellants are the subjects of several manufacturing technologies efforts. Work will address production processes for fabricating composite motor cases with integral pole pieces and attachments, thermo-mechanical fabrication of steel motor cases and continuous propellant mixing and loading processes.

Proposals in the area of test equipment include work on electrical, x-ray and neutron equipment. Calibration efforts include infrared testing of PC boards, digital fault isolation, and automatic circuit tuning.

M I C O M  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY -----	FY82 -----	FY83 -----	FY84 -----	FY85 -----	FY86 -----
CONTAINERS/LAUNCHERS	0	0	0	338	300
CONTROL SYSTEM	1000	2100	4200	3200	2621
FACTORY MODERNIZATION	1800	3840	2200	0	0
GROUND SUPPORT EQUIPMENT	0	0	0	450	1050
GUIDANCE SYSTEM	900	2000	7625	12510	14250
INTEGRATED ELECTRONICS	0	0	0	350	250
MISSILE STRUCTURE	960	550	500	2100	1600
PREPULSION SYSTEM	2360	1110	350	1875	2727
TEST EQUIPMENT	1600	700	800	1150	2100
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TOTAL	8620	10300	15675	21973	24898

MMT FIVE YEAR PLAN  
RCS DRCMT 126

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*CONTAINERS/LAUNCHERS\*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- LAUNCHERS

(1027) TITLE - LOW COST SMALL ROCKET CONTAINER/LAUNCHER PODS

338 300

PROBLEM - CURRENT LAUNCH PODS ARE EXPENSIVE AND REQUIRE REUSE IN ORDER TO MAINTAIN COST PER ROUND AT AN ACCEPTABLE LEVEL.

SOLUTION - LOW COST PLASTICS WILL BE APPLIED TO THE STRUCTURE - COMMERCIAL GRADE PLASTICS SUCH AS ABS, PVC, AND FOAMS IN MOLDED AND FORMED SHAPES WILL BE CONSIDERED. LONG TERM SERVICE ENVIRONMENT WILL BE EVALUATED BY ACCELERATED AGING AND CREEP TESTING.

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\* C A T E G O R Y \*  
\*-----\*  
\*CONTROL SYSTEM\*  
\*\*\*\*\*

COMPONENT -- CIRCUITRY

(1063) TITLE - SEMIADAPTIVE REEL TO REEL FLEX PRINT PROCESS

421

PROBLEM - CONVENTIONAL BATCH PROCESSING OF PRINTED WIRING BOARDS IS LABOR INTENSIVE. HAND LABOR IS BOTH COSTLY AND SUBJECT TO ERRORS WHICH ADDS REJECT LOSSES TO LABOR COSTS.

SOLUTION - A REEL TO REEL MFG PROCESS FOR PWB'S WILL PRODUCE COMPLETE PWB'S FROM REELS OF CLAD STUCK IN A SEQUENTIAL SET UP OPERATIONS. THE OUTPUT CIRCUITS WILL BE FLAT CABLE OR FLEXIBLE CIRCUITRY.

(1075) TITLE - ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM)

1000 1100 2200 2200 2200

PROBLEM - ALTHOUGH INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS AND CABLES ARE DESIGNED ON A COMPUTER, THERE IS LITTLE COMPUTERIZED CONTROL OF PROCESSES USED TO PRODUCE THESE ITEMS. A MASTER PLAN IS NEEDED TO DEFINE THE AREA AND REQUIREMENTS.

SOLUTION - DEVELOP A GOOD MASTER PLAN FOR COMPUTER-AIDED DESIGN AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE'S ICAM AND NASA'S IPAD PROGRAMS TO DEFINE CAD/CAM AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS, AND CABLES.

(1109) TITLE - RUBOTIZED WIRE HARNESS ASSEMBLY SYSTEM

150 1000 1000

PROBLEM - WIRE HARNESS FABRICATION IS A LABOR INTENSIVE PROCESS. APPROXIMATELY 50% OF HARNESS FABRICATION TIME IS DEVOTED TO HANDLING, SORTING, AND IDENTIFICATION. HARNESS ASSEMBLY IS DONE BY HAND. PROCEDURES USE SEVERAL WORKSTATIONS AND REPEATED HANDLING.

SOLUTION - A COMPUTER CONTROLLED MANIPULATOR (RUBOT) WITH SIX DEGREES OF FREEDOM INCORPORATES WIRE PREPARATION, HARNESS ASSEMBLY, AND TESTING INTO A SINGLE WORKSTATION. AN INTEGRATED SYSTEMS APPROACH WILL INCORPORATE STATE-OF-THE-ART EQUIPMENT AND TECHNIQUES.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- CIRCUITRY

(CONTINUED)

(1127) TITLE - ULTRA HIGH RESOLUTION INSPECTION SYSTEM FOR LSI

2000 1000

PROBLEM - LARGE SCALE INTEGRATED (LSI) CIRCUITS INCLUDE MINIATURIZED COMPONENTS OF .001 INCHES OR LESS IN SIZE. IN ORDER TO INSPECT/DETECT CERTAIN FLAWS, TWINING STACKING, PATH METALLIZATION ETC, A MINIMUM X-RAY RESOLUTION 1000 LINE PER INCH IS REQUIRED.

SOLUTION - DEVELOP A PROTOTYPE ULTRA HIGH RESOLUTION LSI INSPECTION SYSTEM USING A RECENTLY DEVELOPED X-RAY IMAGING TECHNIQUE, FIBEROPTIC SCIENTILLATOR PANEL. THIS SYSTEM WILL BE A DIRECT VIEWING PROTOTYPE INSPECTION WITH 4000 LINES/INCH RESOLUTION

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\* C A T E G O R Y \*  
\*-----\*  
\*FACTORY MODERNIZATION \*  
\*\*\*\*\*

COMPONENT -- ALL

(1121) TITLE - MISSILE MANUFACTURING PRODUCTIVITY IMPROVED PROGRAM

1800 3840 2200

PROBLEM - THE HELLFIRE MISSILE WILL BE BUILT IN FACILITIES THAT ARE NOT MODERN, WITH PROCESSES THAT ARE NOT OPTIMUM AND WITH EQUIPMENT THAT IS NOT UPDATED. A STUDY OF METHODS, EQUIPMENT AND FACILITIES IS NEEDED WITH A VIEW TOWARD MODERNIZATION.

SOLUTION - DEVELOP A PLANT MODERNIZATION PLAN IN WHICH GOVERNMENT AND THE COMPANIES SHARE IN THE UPDATING OF PROCESSES AND EQUIPMENT AND ALSO SHARE IN THE SAVINGS OBTAINED. CONDUCT PROGRAMS AT RUCKWELL, COLUMBUS AND MARTIN, ORLANDO.

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\* C A T E G O R Y \*  
\*-----\*  
\*GROUND SUPPORT EQUIPMENT\*  
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COMPONENT -- CIRCUITRY

(1165) TITLE - PROD OF QUIET RADAR SIGNAL PROCESSORS USING VLSI TECHNOLOGY

450 550

PROBLEM - THE MAN TECH BASE TO PRODUCE RADAR SIGNAL PROCESSORS USING VHSI (VERY HIGH SPEED INTEGRATED CIRCUITS) DOES NOT EXIST. METHODS USING LSI (LARGE SCALE INTEGRATED) CHIPS ARE INADEQUATE. HOWEVER, SOME TECHNIQUES MAY BE TRANSLATABLE TO VLSI.

SOLUTION - THIS PROJECT WILL USE FOUR CHIPS DEVELOPED UNDER ANOTHER MMT PROGRAM TO ESTABLISH MANUFACTURING METHODS FOR THE QUIET RADAR SIGNAL PROCESSOR. PROJECT WILL REDUCE COST AND IMPROVE RELIABILITY AND MAINTAINABILITY.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- CIRCUITRY

(CONTINUED)

(3233) TITLE - COMPUTERIZED INTEGRATED MANUFACTURING SUPPORT (CAM)

PROBLEM - MANUFACTURING SYSTEMS MUST BECOME MORE PRODUCTIVE, FLEXIBLE AND PRECISE AND BETTER ABLE TO COPE WITH VARYING REQUIREMENTS.

SOLUTION - ESTABLISH A SYSTEM DESIGN RELATING INPUT, OUTPUTS, FORMATS, AND DATA TO MEET REQUIREMENTS OF THE TOTAL DESIGN TO USE PROGRESSION.

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\* C A T E G O R Y \*  
\*-----\*  
\*GUIDANCE SYSTEM \*  
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COMPONENT -- HYBRIDS

(1D66) TITLE - ADDITIVE SINGLE AND MULTILAYER HYBRID CIRCUITRY

PROBLEM - THICK FILM CIRCUITRY USES THE SCREEN AND FIRE PROCESS ON CERAMIC SUBSTRATES. A SEMIADDITIVE FINE-LINE PROCESS, ELECTROLESS COPPER PLATING, USED ON FIBERGLASS AND CERAMIC SUBSTRATES WILL PROVIDE BETTER FINE-LINE AND A COST REDUCTION.

SOLUTION - LAMINATE SURFACE CONDITIONS AND ELECTROLESS COPPER CATALYST STRENGTHS WILL BE INVESTIGATED. VARIATIONS IN PROCESSING PARAMETERS WILL BE EVALUATED. SOFTWARE TECHNIQUES FOR AUTOMATION OF MANUFACTURING PROCESSES WILL BE DEVELOPED.

(1D95) TITLE - AUTOMATIC SEALING OF HYBRIDS

PROBLEM - HYBRID CIRCUIT ASSEMBLIES FOR MILITARY USE REQUIRE HERMATIC SEALING WHICH IS ACCOMPLISHED BY SOLDERING OR WELDING. BOTH TECHNIQUES REQUIRE AN OPERATOR, INVOLVING LABOR INTENSIVE HANDLING AND SET UP ERRORS.

SOLUTION - ESTABLISH AN AUTOMATIC HERMATIC SEALING SYSTEM USING A COMPUTER OR MICROPROCESSOR BASE AND BY MODIFYING EXISTING HERMATIC SEALING EQUIPMENT.

COMPONENT -- INTEGRATED ELECTRONICS

(1067) TITLE - USE OF ELECTROLESS NICKEL BURIN ON PWB CONNECTORS

PROBLEM - GOLD OVER NICKEL PLATING USED ON ONE PIECE CARD EDGE CONTACTS IS A MAJOR COST ITEM. THE COST CAN BE REDUCED BY REPLACING GOLD WITH A BASE METAL ALLOY.

SOLUTION - NICKEL BURIN PROVIDES A SATISFACTORY CONTACT MATERIAL AND HAS AN INEXPENSIVE ELECTROLESS PLATING PROCESS. THE REMAINING PROBLEMS OF UNWANTED PLATING AND OCCASIONAL FAILURES TO STRIKE SEEM TO HAVE A HIGH PROBABILITY FOR SOLUTION.



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- INTEGRATED ELECTRONICS (CONTINUED)

(1072) TITLE - MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MFG

1540 1000 1200

PROBLEM - LOW VOLUME PURCHASE OF LSI CHIPS DOES NOT LEND ITSELF TO CIRCUIT VARIATIONS. LARGER THAN NEEDED NUMBERS OF CHIPS MUST BE ORDERED TO GET THE PRODUCER'S ATTENTION. A LOW-VOLUME CHIP CAPABILITY IS NEEDED.

SOLUTION - ANALYZE ALL LSI RESEARCH RESULTS AND SINGLE OUT NEW PROCESSING TECHNIQUES. ESTABLISH A MILITARY CAPTIVE DESIGN AND PRODUCTION LINE. DEVELOP SOFTWARE FOR CAD OF LSI CIRCUITS. PRODUCE VARIATIONS OF SEVERAL CIRCUIT FAMILIES.

(1084) TITLE - ELIMINATE GOLD ON CABLE CONNECTOR PINS

350

PROBLEM - GOLD FLASH OVER NICKEL PLATE IS STANDARD FOR PINS IN MILITARY CONNECTORS. GOLD IS EXPENSIVE AND A SUBSTITUTE IS NEEDED.

SOLUTION - EVALUATE PALLADIUM, TIN-NICKEL, AND NICKEL WITH OR WITHOUT TIN OR INDIUM AS A LUBRICANT. SET UP PULSE PLATING AND OTHER PROCESSES FOR APPLYING THE NEW METALS. COORDINATE WITH AFML.

(1093) TITLE - PRODUCTION METHODS FOR A MILLIMETER MODULAR TRANSPONDER

650 1200

PROBLEM - TRANSPONDERS NOW REQUIRE MUCH HAND FABRICATION LABOR AND ARE HIGH COST. THEY ARE USED ONLY ONCE. THEY MUST RECEIVE A GUIDANCE RADAR SIGNAL, DECODE IT, FORM A CLOED REPLY AND TRANSMIT IT TO THE GUIDANCE RADAR. MUST WITHSTAND A HIGH-G ENVIRONMENT.

SOLUTION - REDUCE CONFIGURATION TO A FORM THAT MINIMIZES MFG COST. MODULARIZE TRANSPONDER BY FUNCTION ANTENNA MODULE, RECEIVER MODULE, DECODING MODULE, ENCODING MODULE, TRANSMITTER MODULE, POWER SUPPLY MODULE. BUILD MODULES TO FIT IN A FOUR INCH MI. USE LSI.

(1103) TITLE - STABLE MATERIALS ? MANUFACTURING FOR MULTILAYER PWB

500 500

PROBLEM - MATERIAL FAILURE AND INTERLAYER MIS-REGISTRATION IN MULTILAYER CIRCUIT BOARDS INCREASES WITH THINNER BASE LAMINATES. SPECIFICATIONS FOR RAW MATERIALS AND CONTROL ON LAMINATES THAT WILL REDUCE BOARD STRESSES INTRODUCED BY BONDING ARE REQUIRED.

SOLUTION - ESTABLISH A RELATIONSHIP BETWEEN MATERIAL VARIABLES AND DIMENSIONAL STABILITY. APPLY DATA TO FOSTER MATERIALS AND BOARD FABRICATION METHODS THAT REDUCE FREQUENCY OF MISREGISTERED BOARDS AND BOARD FAILURE DUE TO MATERIAL FAILURE.

(1164) TITLE - COMPONENT SIDE PRINTED CIRCUIT BOARD SOLDERING

350

PROBLEM - THERE IS NO KNOWN METHOD FOR HOLDING COMPONENTS IN ALIGNMENT FOR MOUNTING.

SOLUTION - REFINE PROCESS FOR FOIL SIDE MOUNTING OF COMPONENTS TO ACCOMMODATE FLEXIBLE CIRCUITS.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT -- INTEGRATED ELECTRONICS (CONTINUED)

(3184) TITLE - SCREEN PRINTING PROCESSES FOR PTH ON PLASTIC PCB'S

PROBLEM - SET UP AND RUN TIME FOR ELECTROLESS COPPER PLATED THRU HOLES (PTH) IS APPROXIMATELY 3.75 MIN PER BOARD WITHOUT INSPECTION OR MAINTENANCE.

SOLUTION - SCREEN PRINTING COULD ACCOMPLISH THE SAME JOB IN APPROXIMATELY .48 MIN PER BOARD. INVESTIGATE CURING CYCLE, SCREEN PREPARATION TIME, AND PASTE TECHNOLOGY FOR OPTIMUM FLUX THRU HOLES.

(3411) TITLE - MANUFACTURE OF NON PLANAR PRINTED CIRCUIT BOARDS

PROBLEM - USE OF FLAT CIRCUIT BOARDS RESULTS IN COMPLEX AND EXPENSIVE INTERCONNECTIONS WITH LOWERED RELIABILITY.

SOLUTION - DEVELOP THE PROCESSES TO PRODUCE NON-PLANAR CIRCUIT BOARDS SHAPED TO FIT THE AVAILABLE COMPARTMENTS. CIRCUIT PATTERNS WILL BE EXPOSED ON THE INSIDE WITH A PROJECTION MECHANISM OR WITH SOFT X-RAYS. A METHOD OF MASS SOLDERING WILL BE DEVELOPED.

COMPONENT -- OPTICS

(11069) TITLE - MANUFACTURE OF GRADIENT INDEX LENSES

PROBLEM - MILITARY OPTICAL SYSTEMS ARE HEAVY, AWKWARD, EXPENSIVE AND DIFFICULT TO MAINTAIN ALIGNMENT. ASPHERIC LENSES HAVE COMPLEX SHAPES REQUIRING SPECIAL POLISHING TECHNIQUES WHICH CAUSE THE LENSES TO BE COSTLY.

SOLUTION - ESTABLISH MANUFACTURING PROCESS FOR THE PRODUCTION OF OPTICAL QUALITY GRADIENT INDEX LENSES.

COMPONENT -- RADOMES

(1122) TITLE - PRODUCTION OF HIGH PERFORMANCE LOW COST CERAMIC IR DOMES

PROBLEM - OPTICAL GUIDANCE SYSTEMS FOR HIGH PERFORMANCE MISSILE SYSTEMS WILL REQUIRE CERAMIC DOMES. THE ONLY MATERIAL CURRENTLY AVAILABLE, SINGLE CRYSTAL SAPPHIRE, REQUIRES SPECIAL PROCESSING FACILITIES AND EXPENSIVE SECONDARY OPERATIONS.

SOLUTION - BASED ON THE RESULTS OF ONGOING RESEARCH ACTIVITY, A MATERIAL WILL BE SELECTED FOR FABRICATION USING FORM TO SHAPE PROCESSES.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- SEEKERS

(11083) TITLE - IMP MFG PROC F/FOUR-IN DIAMETER FOCAL PLANE ARRAY SEEKERS

PROBLEM - STARING FOCAL PLANE ARRAY DETECTORS MAKE REDUCTION IN INFRARED SEEKER MECHANICAL COMPLEXITY AND SIZE NOT PREVIOUSLY POSSIBLE. ACHIEVING HIGH PRODUCTION RATE WITH HIGH YIELD IN FABRICATION OF THIS NEW TYPE SEEKERHEAD IS A PROBLEM

SOLUTION - ESTABLISH MANUFACTURING PROCEDURE FOR LARGE VOLUME HIGH YIELD PRODUCTION OF STARING FOCAL PLANE ARRAY DETECTORS AND SMALL DIAMETER SEEKERHEADS.

(11123) TITLE - IMPROVED MFG PROCESSES STARING FOCAL PLANE ARRAY DETECTORS

PROBLEM - THERE IS NO METHOD FOR MAKING A STARING 128X128 FOCAL PLANE ARRAY FOR SEEKERS THAT INCLUDES THE SIGNAL PROCESSING AND DEWAR ASSEMBLY. PRESENTLY, UNITS ARE HAND-MADE WITH ATTENDANT HIGH COSTS. LONGER LIFE DEWARS ARE NEEDED.

SOLUTION - THE DETECTOR MATERIAL WILL BE MADE IN 10 MICRON THICK WAFERS BY THE LIQUID PHASE EPITAXY PROCESS. A METHOD WILL BE DEVELOPED TO FORM THE ARRAY AND ATTACH IT TO THE PROCESSING CHIPS AND DEWAR ASSEMBLY.

(11124) TITLE - IMPROVED MFG PROC F/8-10 MICRON SCANNING TDI FPA DETECTORS

PROBLEM - THERE IS NO PRODUCTION METHOD FOR MAKING A SCANNING FOCAL PLANE ARRAY FOR SEEKERS THAT INCLUDES THE SIGNAL PROCESSING AND DEWAR ASSEMBLY. PRESENTLY, UNITS ARE HAND-MADE WITH ATTENDANT HIGH COSTS. LONGER LIFE DEWARS ARE NEEDED.

SOLUTION - THE DETECTOR MATERIAL WILL BE MADE IN 10 MICRON THICK WAFERS BY THE LIQUID PHASE EPITAXY PROCESS. A METHOD WILL BE DEVELOPED TO FORM THE ARRAY AND ATTACH IT TO THE PROCESSING CHIPS AND DEWAR ASSEMBLY.

(11131) TITLE - AN INTEGRATED 94 GHZ SUBMUNITIONS TRANSCIEVER

PROBLEM - THE TRANSCIEVER IS VERY EXPENSIVE DUE TO THE LABOR REQUIRED TO MATCH, ALIGN AND TEST COMPONENTS AND TO INTEGRATE THESE COMPONENTS INTO A TRANSCIEVER WHICH HAS THE REQUIRED PERFORMANCE.

SOLUTION - EQUIPMENT FOR A DEPOSITION PROCESS DEVELOPED AT ERADCOM WILL BE ASSEMBLED TO PLACE TRANSMISSION MEDIA AND DEVICES ON A SUBSTRATE BASE. THIS EQUIPMENT AND THE PROCEDURES FOR IT WILL CONTROL THE CRITICAL TOLERANCES REQUIRED.

(13178) TITLE - IMPROVED MANUFACTURING PROCESSES FOR LASER IR/OPTICAL SEEKER

PROBLEM - FIBER OPTICS FIXTURE ARE DIFFICULT AND EXPENSIVE TO MAKE.

SOLUTION - REDUCE FIBER OPTICS FIXTURE DIFFICULTIES BY DEVISING METHODS TO REDUCE HANDLING OF FIBER FIXTURE AND DETECTOR ARRAY.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- SEEKERS

(CONTINUED)

(1078) TITLE - IMPROVED MANUFACTURE OF INFRARED SUBMISSILE SEEKERS

PROBLEM - LOW YIELD OF SEEKER COMPONENTS IS DUE TO HANDLING AND CHECKOUT OF GYRO OPTICS.

SOLUTION - PROVIDE LOWER COST SPHERICAL ELEMENTS TO REPLACE THE ASPHERICS. PROVIDE A FIBER OPTIC CUTTING METHOD THAT WILL ELIMINATE THE NEED TO POLISH THE FIBER ENDS. OPTIMIZE THE FIBER OPTIC MATERIALS TO EXTEND THE OPERATING RANGE TO LONGER WAVELENGTHS.

500 750

COMPONENT --- SENSORS

(1079) TITLE - WIDE AREA MERCURY-CADMIUM-TELLURIDE QUADRANT DETECTORS

PROBLEM - LARGE AREA MERCURY-CADMIUM-TELLURIDE QUADRANT DETECTORS FOR IR SEEKERS ARE EXPENSIVE BECAUSE OF HIGH MATERIAL COST AND LOW YIELD. THE MATERIAL IS HARD TO GROW TO THE RIGHT CHEMICAL BALANCE. SLICING, ION IMPLANTATION AND/OR DIFFUSION ARE TOUCHY.

SOLUTION - FIND THE EXACT CHEMISTRY FOR GOOD DETECTOR OUTPUT. LOOK AT CLOSED LOOP COMPUTER CONTROL OF CRYSTAL PULLING. OPTIMIZE X-RAY CHARACTERIZATION, SAWING, POLISHING, ION IMPLANTATION, AND TESTING.

350 350

(1080) TITLE - ION IMPLANTED THIN FILM TRANSISTORS

PROBLEM - PROCESSES FOR MANUFACTURING THIN FILM TRANSISTORS PRODUCE INCONSISTENT RESULTS DUE TO INABILITY TO CONTROL THE GEOMETRIES AND ELECTRICAL PROPERTIES OF THE MATERIAL.

SOLUTION - ESTABLISH ION IMPLANT TECHNOLOGY APPLICABLE TO THE DESIGN AND FABRICATION OF THIN FILM ACTIVE DEVICES.

350 350

(1084) TITLE - PROD METH F/MILLIMTR MONOPULSE ANTENNA F/DIR FIRE APPL

PROBLEM - SENSOR ANTENNA SYSTEM NEEDS RELATIVE ALIGNMENT FACTORS BETWEEN DIELECTRIC LENS, MOVABLE REFLECTOR AND ACTIVE ANTENNA ELEMENT REQUIRING ANTENNA FEED UNITS BUILT BY HAND.

SOLUTION - ESTABLISH METHODOLOGY FOR CONSTRUCTING MONOPULSE ANTENNA INTO A COMPATIBLE PACKAGE WITH A 5 MILLIRADIAN BEAM WIDTH AT 94 GHZ.

675 1200

(1098) TITLE - LARGE DIAMETER SILICON

PROBLEM - MILITARY REQUIREMENTS FOR DETECTORS ARE EXCEEDING STANDARD SIZES. SPECIAL TOOLING AND REPLACEMENT PARTS CREATE A PREMIUM ON COST AND TIME DELAYS.

SOLUTION - INVESTIGATE ETCHING, ULTRASONIC CAVITATION, LASER SCRIBING, SAWING AND TREPPANING FOR CUTTING .8 IN DISCS FROM 3 IN WAFERS. REDUCE STRESS AND PREVENT FAILURES.

160

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- SENSORS

(CONTINUED)

(1109) TITLE - MFG METH AND TECH F/PIN DIODES AT MILLIMETER WAVE FREQUENCY

PROBLEM - CURRENT MANUFACTURE TECHNIQUES FOR DIODES ARE LIMITED BY WAFER SIZE AND BONDING. OTHER PROBLEMS INCLUDE METAL SYSTEMS WITH BONDING AND ETCHING, SAWING, LAPPING AND POLISHING FOR PRECISE DIMENSIONS.

SOLUTION - ESTABLISH METHODS FOR WAFER SAWING, STACKING AND BONDING, AND FOR STACK SAWING, LAPPING, AND POLISHING IN ORDER TO OBTAIN A THREE DIMENSIONAL DIODE STRUCTURE. THEN FIT AND ATTACH POLISHED STACKS TO WAVEGUIDE WALL. ALSO SET UP A HIGH TEMP METAL SYST.

300

(1104) TITLE - IMPROVED SANDWICH DETECTOR FABRICATION FOR INFRARED SEEKERS

PROBLEM - FABRICATING TWO DETECTORS INTO A SANDWICH CAUSES LOWER SENSITIVITY, CROSS TALK, POOR TRANSMISSION, AND PROVIDES A DETECTOR TO THICK FOR A COMMON FOCUS.

SOLUTION - ESTABLISH METHODOLOGY FOR PRODUCING DETECTOR OPERATING IN TWO SPECTRAL BANDS FROM ONE PIECE OF MATERIAL.

400

(1120) TITLE - DETECTOR GRADE CADMIUM SULFIDE (CUS)

PROBLEM - CURRENTLY AVAILABLE PROCESSES FOR PRODUCING CADMIUM SULFIDE CRYSTALS OFTEN RESULT IN SMALL BOULE SIZES THAT LOSE CRYSTALLINITY, LARGE RESISTIVITY VARIATIONS, AND HIGH DENSITY OF CRYSTALLINE FLAWS.

300

SOLUTION - SEEK IMPROVEMENTS IN THE CURRENT PROCESS AND DEVELOP NEW PROCESSES.

(1128) TITLE - IMPROVED MANUF PROC F/CO2 BEAMRIDER MISSILE RECEIVERS

PROBLEM - THE COST OF THE R+D PROTOTYPE RECEIVER MODELS IS FROM \$20K TO \$60K. FABRICATION IS HIGHLY LABOR INTENSIVE AND THE YIELD RATE IS LOW. TO BE CONSIDERED FOR IMPLEMENTATION, COSTS MUST BE BROUGHT DOWN TO \$700.00 OR LESS.

1000

1500

(3175) TITLE - MANUFACTURING PROCESSES FOR SOLID STATE IMAGING SENSORS

PROBLEM - EXISTING PROCESSES ARE LOW YIELD AND NON-UNIFORM, MECHANICAL VAPOR DEPOSITION MUST BE OPTIMIZED.

SOLUTION - ESTABLISH THE PROCESSES CIRCUMVENTING PRESENT PROBLEMS ON WIRE BONDING, TREAKING, TESTING, ETC.

300

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- WINDOWS/RADOMES

(1108) TITLE -- RF AND LASER HARDENING OF MISSILE DUMES

PROBLEM -- CURRENT RADOMES ARE SUSCEPTIBLE TO DAMAGE BY LASER ENERGY AND ALSO PERMIT LASER AND RADIO FREQUENCY ENERGY TO DAMAGE THE DETECTOR.

SOLUTION -- DEVELOP RF SPUTTERING METHODS TO APPLY INDIUM OXIDE, TIN OXIDE AND ANOTHER MATERIAL TO THE INSIDE OF THE GLASS OR PLASTIC RADOME. USE COATINGS THAT PASS ONLY .8 TO 1.5 MICRON WAVELENGTHS.

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\* C A T E G O R Y \*  
\*-----\*  
\*INTEGRATED ELECTRONICS \*  
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COMPONENT -- CIRCUITRY

(1097) TITLE -- LOW MASS FIBER CONDUCTOR

PROBLEM -- PRESENT CHIP AND WIRE TECHNOLOGY USES 1 MIL GOLD OR ALUMINUM WIRE FOR INTERCONNECTING IC CHIPS TO HYBRID SUBSTRATES. A 1 MIL SYNTHETIC FIBER WOULD PRECLUDE MOST BOND INTERFACE FAILURES. FIBER RESISTIVITY, DIA ? COMPATIBLE EPURITIES ARE PROBLEMS.

SOLUTION -- VARIOUS SYNTHETIC FIBERS, CONDUCTIVE EPOXY BONDING, ? METALLIC PLATING WILL BE EVALUATED. SUITABLE BONDING EQUIPMENT WILL BE ESTABLISHED ? COORDINATED WITH OPTIMUM FIBER CONDUCTOR.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*MISSILE STRUCTURE \*  
\*\*\*\*\*

COMPONENT -- AIRFRAMES-COMPOSITES

(1020) TITLE -- MFG PROCESSES FOR FUSED SILICA FIBERS

PROBLEM -- THERE IS NO COMMERCIAL SOURCE FOR HIGH PURITY FUSED SILICA FIBERS.

SOLUTION -- SCALE-UP PROCEDURES USED FOR FIBER OPTICS APPLICATIONS AND SET UP A PILOT PRODUCTION LINE TO PRODUCE FUSED FIBERS OF STRUCTURAL QUALITY

500 500



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- AIRFRAMES-COMPOSITES (CONTINUED)

(11080) TITLE - LOW COST CARBON/CARBON NOSETIPS

PROBLEM - THE WEAVING PROCESS TO FABRICATE CARBON/CARBON NOSETIP PREFORMS IS LABOR INTENSIVE BECAUSE OF THE FINEWEAVE CENTER-TO-CENTER YARN SPACINGS. IN ADDITION, PREFORMS USE EXPENSIVE GRAPHITE YARN AND REQUIRE LONG IMPREGNATION CYCLES.

SOLUTION - DEVELOP OPTIMAL FABRICATING PROCEDURES FROM LOWER COST MATERIALS, PITCH RESIN AND T-300 CARBON FIBERS. UTILIZATION OF SHORTER DENSIFICATION CYCLES PREFORMS, AND FIBER SPACINGS WILL PROVIDE THE MEANS FOR REDUCING CYCLE TIMES.

(11082) TITLE - HIGH ANGLE TAPE WRAPPED HEATSHIELDS

PROBLEM - DATA HAS SHOWN THAT THE EROSION PERFORMANCE OF TAPE WRAPPED HEATSHIELDS IMPROVES AS THE SHINGLE ANGLE INCREASES ABOVE 30 DEGREES. CURRENT MFG TECHNIQUES DO NOT LEND THEMSELVES TO HIGH WRAP-ANGLE HEATSHIELDS.

SOLUTION - DEVELOP IMPROVED WRAPPING TECHNIQUES TO CURRENT TAPE WRAPPING EQUIPMENT AND PROCESSING TECHNOLOGY.

COMPONENT -- COMPONENTS

(11073) TITLE - REAL TIME ULTRASONIC IMAGING

PROBLEM - EXISTING ACOUSTICAL HULLOGRAPHY INSP. SYS PRODUCES UNSATISFACTORY VIDEO IMAGES DUE TO POOR RESOLUTION, SIGNAL NOISE AND LOW SPATIAL FREQ. ABERRATIONS.

SOLUTION - A 3 CHANNEL PIPELINE PROCESSOR WITH ASSOCIATED 512X512X8 MEMORIES WITH A 30 FRAMES/SEC DISPLAY CAPABILITY. THIS SYS WOULD ELIMINATE ABERRATION, IMPROVE CONTRAST, AND REDUCE SIGNAL NOISE.

(13288) TITLE - MANUFACTURING TECHNOLOGY FOR DIE CASTING

PROBLEM - WEIGHT AND SPACE CONSTRAINTS HAVE RESULTED IN COMPLEX AND HIGH DENSITY CONFIGURATIONS OF METAL PARTS WHICH ARE MACHINED.

SOLUTION - ESTABLISH AND PROVE-OUT DIE CASTING TECHNIQUES FOR THESE COMPLEX CONFIGURATION.

COMPONENT -- MACHINING

(13302) TITLE - ELECTRO DISCHARGE MACHINING PROCEDURE

PROBLEM - THERE ARE MANY FABRICATION PROBLEMS DUE TO TIGHT TOLERANCE REQUIREMENTS IN FABRICATING MOUNTING HOLES FOR ARRAY ELEMENTS OF THE RADAR ANTENNAS.

SOLUTION - ESTABLISH TOOLING AND TECHNIQUES FOR FORMING HOLES IN FULL-SIZE ARRAY ELEMENT SUPPORT PLATES BY ELECTRO DISCHARGE MACHINING.

550 500 450

500 700

200 960

650

400



\*\*\*\*\*  
 \* C A T E G O R Y \*  
 \*-----\*  
 \*PROPULSION SYSTEM \*  
 \*\*\*\*\*

MMT FIVE YEAR PLAN  
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- MOTOR CASES

(1088) TITLE - OPTIMIZED MANUREL FAB AND UTILIZATION F/COMP MOTOR CASES

700 400

PROBLEM - OPTIMIZING PRODUCTION PROCEDURES TO OBTAIN LOWEST UNIT COST WHILE MAINTAINING RELIABILITY IN FABRICATION.

SOLUTION - ESTABLISH PRODUCTION PROCEDURES AND PRODUCTION RATES FOR MANUREL FABRICATION. THIS WILL PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO CURRENT AND FUTURE MOTOR COMPONENT REQUIREMENTS.

(1089) TITLE - INTEGRAL ROCKET MOTOR COMPOSITE POLE PIECES AND ATTACHMENTS

350 350

PROBLEM - CURRENT FILAMENT WOUND COMPOSITE ROCKET MOTOR CASES REQUIRE FORGED METAL POLE PIECES, NOZZLE CLOSURE ATTACHMENT RINGS, AND OTHER ATTACHMENT RINGS. THESE COMPONENTS ARE EXPENSIVE, AND REQUIRE LONG LEAD TIME PROCUREMENT.

SOLUTION - ESTABLISH A FILAMENT WINDING PRODUCTION PROCESS FOR FABRICATING COMPOSITE MOTOR CASES WITH INTEGRAL POLE PIECES, AFT ATTACHMENT RINGS, AND FORWARD AND AFT DOME SECTIONS.

(1343) TITLE - FABRICATION OF INTEGRATED CASE AND GRAIN

750

PROBLEM - CONSIDERABLE LABOR IS REQUIRED TO MANUFACTURE ASSEMBLE AND FINISH PROPULSION SYSTEMS.

SOLUTION - DEVELOP STRIP WOUND INTEGRATED CASE AND GRAIN PROCESS TO INTEGRATE MANUFACTURE ASSEMBLY AND FINISHING IN LOW COST AUTOMATIC PRODUCTION LINE.

(13419) TITLE - THERMOMECHANICAL METHODS FOR HIGH STRENGTH STL RKT MTR CASES

500

PROBLEM - THE MANUFACTURING PROCESSES FOR HIGH STRENGTH RCKET MOTOR CASES FOR THE MLRS (FORMERLY GRS) RESULT IN A RESIDUAL STRESS PATTERN (RADIAL) THAT DOES NOT TAKE FULL ADVANTAGE OF THE MATERIAL PROPERTIES.

SOLUTION - THIS PROGRAM WOULD DEVELOP AUTOMATED PROCEDURES TO PERFORM THERMO-MECHANICAL FABRICATION OF THE STEEL MOTOR CASES. THIS PROCESS WILL PRODUCE A MORE DESIRABLE STRESS PATTERN FOR INCREASED PERFORMANCE.

COMPONENT -- MOTOR COMPONENTS

(1050) TITLE - LOW COST BRAIDED ROCKET MOTOR COMPONENTS

430 475

PROBLEM - ROCKET MOTOR COSTS TO MEET DESIGN-TO-COST PRODUCTION GOALS HAVE DICTATED REEVALUATION OF MATERIALS AND PROCESSES. MISSILE CASES COMPRISE 1/2 OF PROPULSION SYSTEM COST. EMPHASIS MUST BE PLACED ON ESTABLISHING NEW COMPONENT MFG PROCESSES.

SOLUTION - OPTIMIZE THE PRODUCTION PROCEDURES AND RATES FOR INTEGRALLY BRAIDED CASE/NOZZLE COMPONENTS TO PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO FUTURE MOTOR COMPONENT REQUIREMENTS.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- MOTOR COMPONENTS

(CONTINUED)

(1051) TITLE - REPLACEMENT OF ASBESTOS IN ROCKET MOTOR INSULATIONS

475 475

PROBLEM - PRESENT ASBESTOS CONTAINING INSULATORS CAN NO LONGER BE MANUFACTURED AFTER 1981 DUE ITS BEING IDENTIFIED AS A CARCINOGEN. THUS THE GOVT HAS LOST THE CAPABILITY OF USING INSULATING MATERIALS THAT HAS PROVEN TO BE AN EXCELLENT THERMAL BARRIER.

SOLUTION - FILLER MATERIALS OTHER THAN ASBESTOS ARE AVAILABLE. FIBER GLASS AND SILICA HAVE BEEN USED IN SPECIALIZED APPLICATIONS AND WULLASTONITE LOOKS PROMISING. MATERIALS SPECS AND MOTOR TEST VERIFICATION MUST BE DONE BEFORE A SUBSTITUTE MATERIAL CAN BE USED.

(1086) TITLE - COBALT REPLACEMENT IN MARAGING STEEL F/ROCKET MOTOR COMP

300 610 550

PROBLEM - CURRENT HIGH PERFORMANCE ROCKET MOTOR COMPONENTS UTILIZE MARAGING STEELS IN LARGE QUANTITIES. COBALT, ONE OF THE KEY INGREDIENTS COMES FROM POLITICALLY SENSITIVE AREAS AND IS BECOMING DIFFICULT TO OBTAIN.

SOLUTION - OPTIMIZE MILL PROCEDURES AND EVALUATE IN A ROCKET MOTOR THE NEW COBALT FREE MARAGING STEEL ALLOYS.

(1087) TITLE - APPLICATION OF COMMERCIAL GRADE KEVLAR TO ROCKET MOTOR COMP

400 500

PROBLEM - CURRENT MILITARY ROCKET MOTOR COMPONENTS USE KEVLAR 49 FIBER IN LARGE QUANTITIES. THIS AEROSPACE GRADE IS VERY COSTLY.

SOLUTION - OPTIMIZE MILL PROCEDURES AND MOTOR COMPONENT PROCESSING METHODOLOGY FOR COMMERCIAL GRADE KEVLAR AND EVALUATE THE PERFORMANCE IN A ROCKET MOTOR COMPONENT ENVIRONMENT

COMPONENT -- NOZZLES

(3423) TITLE - LOW COST/HIGH PERFORMANCE FIBROUS GRAPHITE ROCKET NOZZLES

300 400

PROBLEM - ROCKET SYSTEMS USING HIGH PERFORMANCE CARBON/CARBON OR PYROLYTIC GRAPHITE NOZZLES INCUR HIGH COMPONENT COST.

SOLUTION - THIS PROJECT WILL SCALE UP THE FIBROUS GRAPHITE PROCESS TO MAKE FULL-SCALE NOZZLE COMPONENTS AND WILL EXTEND NOZZLE TEST DATA.

COMPONENT -- PROPELLANTS

(1044) TITLE - CONTINUOUS PROCESS FOR PROPELLANT MANUFACTURE

1477

PROBLEM - PROPELLANT MANUFACTURE IS GENERALLY A BATCH PROCESS WITH INHERENT PROBLEMS. CURE ACCELERATORS MUST BE AVOIDED SINCE THEY SHORTEN POT LIFE. THE PROCESS HAS HIGH LABOR REQUIREMENTS. HIGH VISCOSITIES RESULT IN DISCARDING THE BATCH.

SOLUTION - A CONTINUOUS MIXING AND MOTOR LOADING PROCESS WILL REDUCE PRODUCTION LABOR AND FACILITIES, AND IMPROVE PROPELLANT QUALITY AND RELIABILITY. SAFETY PROBLEMS RELATED TO QUANTITY DISTANCES CAN BE MINIMIZED.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- PROPELLANTS

(CONTINUED)

(3317) TITLE - CASTING OF PROPELLANTS

350

PROBLEM - THE ENO BURNING SUSTAINER GRAIN FOR STINGER IS PRESENTLY CAST AND CURED, MACHINED, INHIBITED WITH BUTOL WHICH IS BONDED TO EXTERIOR OF GRAIN.

SOLUTION - DEVELOP CAST-IN-BUTOL PROCESS TO CAST GRAIN DIRECTLY INTO INHIBITOR BUTOL.

(3320) TITLE - NON-DESTRUCTIVE TESTING (NDT) OF PROPELLANTS

275

PROBLEM - THE FULL COMPLEMENT ON NDT TEST BY CURRENT METHODS IS TOO EXPENSIVE TO BE USED.

SOLUTION - DEVELOP A COMPUTERIZED SYSTEM FOR THE ASSESSMENT OF NDT DATA.

(3447) TITLE - SCALE UP AND DEMO FOR THE RECOVER OF CARBORANE FROM WASTE PROP

200

PROBLEM - THE PRODUCTION OF N-HEXYLCARBORANE (NHC) RESULTS IN UP TO 10 PCT REJECTED MATERIAL BECAUSE IT WILL NOT MEET BALLISTIC RATE REQUIREMENTS.

SOLUTION - THE SCRAP PROPELLANT CAN BE DISSOLVED IN PENTANE, DRIED AND DISTILLED TO PURIFY IT. THE NHC THAT WOULD BE SCRAPPED IS THUS RECOVERABLE. THIS PROJECT WILL SCALE UP THE LABORATORY PROCESS SUCH THAT THE TOTAL PROCESS CAN BE DEMONSTRATED.

(3449) TITLE - OPTIONAL PROPELLANT INGREDIENTS

360

PROBLEM - A NUMBER OF CHEMICAL INGREDIENTS USED IN SOLID ROCKET PROPELLANTS HAVE BECOME UNAVAILABLE BECAUSE SOME OF THE REAGENTS ARE HAZARDOUS.

SOLUTION - STUDIES SHOW THAT ISOPHORONE DIISOCYANATE (IPDI) CAN BE MADE IN A BATCH PROCESS WITHOUT USING PHOSGENE. THIS LABORATORY PROCESS WILL BE SCALED UP.

\*\*\*\*\*  
\* CATEGORY \*  
\*-----\*  
\*TEST EQUIPMENT\*  
\*\*\*\*\*

COMPONENT --- ELECTRICAL TEST EQUIPMENT

(3115) TITLE - ENGINEERING FOR CALIBRATION EQUIPMENT

4448 150 600 800 900 1000

PROBLEM - MEASUREMENT SCIENCES OR METROLOGY MUST BE CONTINUALLY ADVANCED IN RELEVANT TECHNOLOGY AREAS TO KEEP PACE WITH MANY ARMY PROGRAMS.

SOLUTION - ADVANCEMENTS MUST BE MADE BY DERIVING NEW TYPES OF STANDARDS.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- ELECTRONIC COMPONENTS

(1060) TITLE -- ELECTRICAL TEST AND SCREENING OF CHIPS

PROBLEM -- ONE UNRELIABLE CHIP IN MILITARY ELECTRONIC ASSEMBLIES CAUSES REJECTION OR DESTRUCTION OF THE ENTIRE PACKAGE. PRESENT MEANS FOR DETERMINING CHIP RELIABILITY OR INTEGRITY IS A PROBE TESTING TECHNIQUE WHICH IS TIME CONSUMING AND DESTRUCTIVE.

SOLUTION -- PLACE A MONOLITHIC CHIP TESTING DEVICE AT THE POINT JUST BEFORE THE CHIP IS BUNDED TO THE SUBSTRATE. INCLUDE ON THE PROBE A NON-DESTRUCTIVE POINT AND A METHOD FOR OXIDE REMOVAL.

(1076) TITLE -- AUTOMATIC RECOGNITION OF CHIPS

PROBLEM -- INABILITY TO RECOGNIZE THE TOPOGRAPHY OF MORE THAN SIX TO SEVEN CHIPS ON A HYBRID SUBSTRATE. MILITARY HYBRID CIRCUITS CARRY TEN TO FIFTEEN TYPE ACTIVE COMPONENTS.

SOLUTION -- MODIFY EXISTING OPTICAL PATTERN RECOGNITION EQUIPMENT FOR COMPONENT AND BOND PAD ALIGNMENT TO RECOGNIZE AN AVERAGE 30 TO 35 DIFFERENT DEVICES PER SUBSTRATE.

(1092) TITLE -- AUTOMATIC TESTING OF SUBSTRATES

PROBLEM -- MULTILAYER HYBRID SUBSTRATE TEST METHODS ARE MECHANICAL, USING A MICROFINE PROBE. THE TEST METHOD IS TECHNICALLY DIFFICULT, TIME CONSUMING AND CONTRIBUTES TO YIELD LOSS.

SOLUTION -- ESTABLISH A PROCESS USING AN ELECTRON BEAM SCANNER. USE COMPUTER-AIDED DEVICES AND A COMPLETE SCANNING SYSTEM WITH A DEFECT LIBRARY DEVELOPED TO INCREASE YIELD IN SUBSTRATE FABRICATION.

(13243) TITLE -- ANALOG FAULT ISOLATION OF PRINTED CIRCUIT BOARDS

PROBLEM -- MANUAL FAULT ISOLATION AND TROUBLE SHOOTING METHODS ARE SLOW.

SOLUTION -- ESTABLISH AUTOMATIC FAULT ISOLATION AND TROUBLE SHOOTING METHODS FOR ANALOG CIRCUIT ASSEMBLIES.

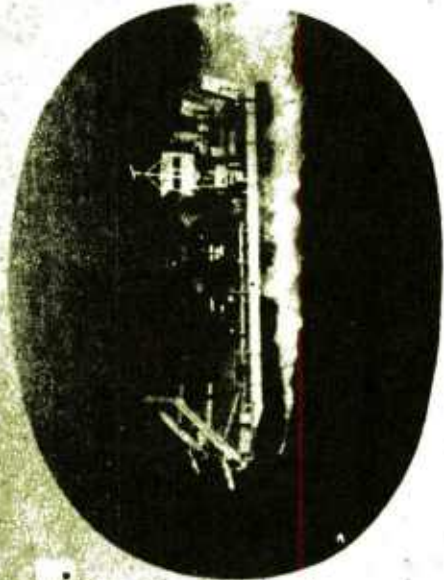
COMPONENT -- X-RAY AND N-RAY

(13241) TITLE -- AUTOMATIC X-RAY READER TEST EQUIPMENT FOR 3D X-RAYS

PROBLEM -- X-RAY IS LIMITED TO A TWO DIMENSIONAL FORMAT AND IS DEPENDENT ON THE TRAINING AND JUDGEMENT OF THE INSPECTOR.

SOLUTION -- AUTOMATE THE ANALYSIS OF X-RAY RESULTS, AND PROVIDE DEPTH PERSPECTIVE BY PARALLEL OR HOLOGRAPHIC TECHNIQUES





Fort Belvoir, Va.



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US ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND

(MERADCOM)

MERADCOM, located at Fort Belvoir, VA, conducts a widely diversified program to improve the Army's combat readiness in four major areas: barrier and counterbarrier systems; countersurveillance systems; energy and environmental systems; and supply distribution and construction equipment systems.

Procurements for items under MERADCOM's cognizance are placed with the private sector, and much of MERADCOM's MMT effort is accomplished by the private sector.

To address the problem of increased system acquisition costs, MERADCOM has identified major problem areas where improved manufacturing technology is needed. Major problem areas confronting MERADCOM include:

a. Limitations of High Temperature Super Alloy Components of Gas Turbine Engines. A limiting factor in the life and performance of gas turbines is the ability of the components to withstand the abrasive and corrosive environment at peak operating temperatures. Super alloy metals utilizing strategic materials are limited to 1750°F operating temperature and are subject to catastrophic failure when subjected to high dust concentrations or corrosive atmosphere such as salt. Thermal efficiency can be improved by increasing peak cycle temperature currently limited by maximum operating temperature of materials of the burner, turbine inlet nozzle, and turbine wheel. The most critical component for damage due to wear and corrosion is the turbine nozzle. Materials are needed which have increased operating temperature limits and improved resistance to corrosion and abrasive wear at a reasonable cost.

b. Providing Military Bridges at Moderate Cost, Which Have High Mobility and High Emplacement Speeds While Retaining The Ability to Withstand the Abusive Treatment Inherent in the Battlefield Environment. High strength, low density composite materials offer great promise for solutions to this problem. Increased production of high strength fiber materials has reduced materials cost. Techniques for the fabrication and installation of these materials into usable bridge components is the area in which large cost reductions are possible. The reduction of presently used labor intensive methods, through the application of automated processes, will reduce component costs. Initial design in these materials offer improved performance due to the flexibility possible in material configuration.

c. Military Quality Power Conditioners. The development of lightweight, military power conditioners depends on the availability of reliable, lightweight, compact electronic components. The power stages of these conditioners employ an important class of these components - power semiconducting devices. The mass, bulk, and inadequate reliability of currently available devices in the required ratings often prevent application to the power stages of military power conditioners under development. Recognizing the limitations of today's power semiconducting devices, MERADCOM has been developing reliable, lightweight, compact power semiconducting devices.



C O M M A N D      M E R A D C O M      F U N D I N G      S U M M A R Y  
(THOUSANDS)

CATEGORY	FY82	FY83	FY84	FY85	FY86
-----	----	----	----	----	----
BRIDGING	0	0	0	1480	650
FIELD FORTIFICATIONS	0	0	130	341	0
GENERAL	0	315	315	314	0
LAND MINES	0	0	916	784	1258
POWER SOURCES	0	0	0	798	801
	----	----	----	----	----
TOTAL	0	315	1361	3717	2709

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*BRIDGING\*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR 82 83 84 85 86  
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COMPONENT --- REINFORCEMENT

(3802) TITLE - HIGH STABILITY TRUSS CHORD

400 200

PROBLEM - PRODUCE A HIGH STIFFNESS, HIGH STRENGTH, LIGHTWEIGHT, LOW COST, TUBULAR TRUSS ELEMENT WHOSE DESIGN IS CONTROLLED BY ITS SLENDER CONFIGURATION AND PHYSICAL PROPERTIES TO MAINTAIN LOCAL AND GLOBAL STABILITY.

SOLUTION - USE THE CONTINUOUS WINDING OF EPOXY WETTED HIGH MODULUS GRAPHITE FIBER TO FORM MULTIPLE STACKED LOOPS WHICH CAN BE PROPORTIONED AND CONFINED TO PROVIDE THE REQUIRED GEOMETRY.

(3803) TITLE - ACCESS/EGRESS MAT PANELS

580 250

PROBLEM - TO PRODUCE AN INEXPENSIVE, LIGHTWEIGHT, METAL PANEL WITH REQUIRED STRENGTH AND SHAPE CHARACTERISTICS USING AN EFFICIENT PRODUCTION METHOD. THE PROVEN PANEL DESIGN FOR ACCESS/EGRESS AT RIVER CROSSINGS IS HAND FABRICATED.

SOLUTION - A ROLL FORMING PROCESS COMBINED WITH OPTIMUM SHEET SIZING PRIOR TO BENDING ARE REQUIRED TO PRODUCE THE REINFORCED, CORRUGATED SHAPE. THIS WILL ELIMINATE THE TIME CONSUMING BREAK PRESS AND HAND WELDING OPERATIONS.

COMPONENT --- STRUCTURAL MEMBERS

(3786) TITLE - MULTI HOLLOW SHEAR WEB MODULE

500 200

PROBLEM - TO PROVIDE A LIGHT WEIGHT SINGLE PIECE WEB MEMBER WHICH CAN BE EASILY ATTACHED TO TOP AND BOTTOM CHORD MEMBERS.

SOLUTION - WIND THE WEB MODULE ON A LARGE INFLATED CYLINDRICAL MANDREL USING GRAPHITE EPOXY. AFTER WINDING IN UNCURED STATE DEFLATE MANDREL AND FORCE WOUND MEMBER INTO WELD HAVING DESIRED WEB SHAPE AND CURE.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*FIELD FORTIFICATIONS\*  
\*\*\*\*\*

COMPONENT --- HOSES

(3800) TITLE - NON-GUM ELASTOMER HOSES

130 341

PROBLEM - HOSE MANUFACTURING HAS CHANGED VERY LITTLE IN 50 YRS. THEY USE GUM RUBBERS, ARE HAND-BUILT AND RESIST AUTOMATION. BESIDES BEING EXPENSIVE PERFORMANCE IS LIMITED IN (1) LOW TEMPERATURE AND (2) COMPATIBILITY WITH A WIDE RANGE OF FLUIDS.

SOLUTION - NEW MATERIALS OFFER IMPROVED PERFORMANCE BUT REQUIRE NEW FABRICATION TECHNIQUES. NEW MANUFACTURING METHODS SHOWN TO BE FEASIBLE UNDER PRIOR R&D. THIS PROJECT PROPOSES TO USE THE NEW MATERIALS, SCALE-UP, OPTIMIZE NEW TECHNIQUES WITH AUTOMATION.

MMST FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT --- MISCELLANEOUS

(3710) TITLE - ADVANCED MFG TECH FOR PRODUCING AIR CYCLE ECU COMPONENTS

315 315 314

PROBLEM - TO REDUCE COST OF COMPRESSOR/EXPANDER PARTS FOR THE ENVIRONMENTAL CONTROL UNIT (ECU) AND TO MEET THE REQUIRED SCHEDULE, A MASS PRODUCTION CAPABILITY MUST BE ESTABLISHED. THIS WORK SUPPORTS AIR CYCLE DEVELOPMENT EFFORTS.

SOLUTION - ESTABLISH AN AUTOMATED PROCESS TO REDUCE COMPLEXITY OF THE SEGMENTED COMPRESSOR AND EXPANDER ROTORS. DEVELOP A TECHNIQUE TO CONTROL THE CONCENTRICITY OF THE COMPRESSOR/EXPANDER STATOR AND THE CAN TRACKS IN THE END PLATES.

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*\*\*\*\*  
\* LAND MINES \*  
\*\*\*\*\*

COMPONENT --- NEUTRALIZERS

(3796) TITLE - COMBAT VEHICLE DEPERMING PRODUCTION FACILITY

916 784 1258

PROBLEM - PRESENT DESIGN AND FABRICATION TECHNIQUES FOR VEHICLES RESULT IN A SIGNIFICANT MAGNETIC SIGNATURE. THIS MAGNETIC SIGNATURE CAN BE USED TO FUZE LAND MINES TO ATTACK THE VEHICLE UNDERCARRIAGE.

SOLUTION - CONSTRUCT A PILOT DEPERMING PRODUCTION FACILITY THAT WILL ALLOW DEVELOPMENT OF A DEGAUSSING TECHNIQUE FOR US ARMORED VEHICLES

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*\*\*\*\*  
\* POWER SOURCES \*  
\*\*\*\*\*

COMPONENT --- MISCELLANEOUS

(3772) TITLE - INTEGRATED POWER SWITCH

408 374

PROBLEM - HIGH DENSITY PACKING OF POWER SEMICONDUCTORS IN THE SWITCH CONCENTRATES THE HEAT SOURCE. ON A CONVENTIONAL HEAT SINK THIS CAUSES HIGH LOCAL TEMPERATURES WITH CONCOMITANT REDUCED RELIABILITY OF SEMICONDUCTOR DEVICES.

SOLUTION - DEVELOP PROCESSES FOR LARGE AREA (3.5 X 7 TO 3.5 X 15 INCH), FLAT SURFACE HEAT PIPE COOLING MODULES TO HANDLE 400 TO 800 WATTS. ELECTRONIC PC CARD HEAT PIPES HAVE MUCH LESS POWER HANDLING CAPABILITY AND ARE NOT MECHANICALLY ADEQUATE.

FUNDING (\$000)

PRIOR 82 83 84 85 86  
-----

COMPONENT --- MISCELLANEOUS

(CONTINUED)

(3785) TITLE - SENSING AND CONTROL MODULE

390 102

PROBLEM - TRANSFORMERLESS INVERTERS UTILIZE MANY DISCRETE SEMICONDUCTORS INTERCONNECTED TO INTEGRATE CIRCUITS IN LIEU OF TRANSFORMERS BUT RESULTING HEAT DISSIPATION REQUIRES A BULKY PACKAGE WITH REDUCED RELIABILITY.

SOLUTION - DEVELOP MANUFACTURING PROCESS FOR MODULES INCORPORATING INTEGRATED CIRCUITS AND OTHER ELECTRONIC COMPONENTS WITH A LARGE SCALE INTEGRATED CIRCUIT REPLACING DISCRETE DEVICES. MODULES ARE TO INCLUDE SATISFACTORY COOLING DEVICE SUCH AS A HEAT PIPE.

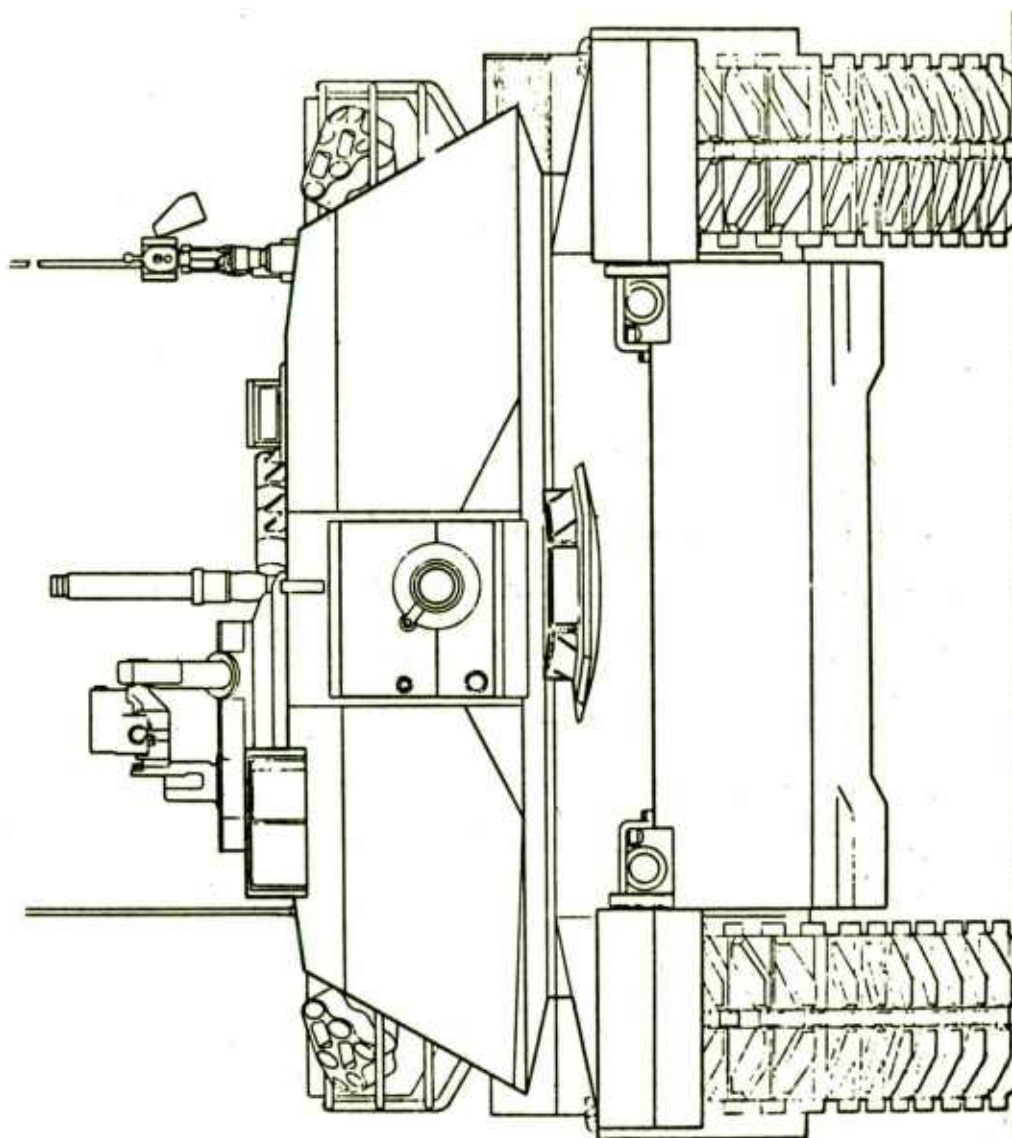
COMPONENT --- TURBINES

(3719) TITLE - HEAT EXCHANGER FOR 10-30 KW REGEN CYCLE GAS TURBINE

325

PROBLEM - GAS TURBINE REGENERATORS AND RECUPERATORS SIGNIFICANTLY INCREASE UNIT COST, SIZE AND WEIGHT WHICH OFFSETS BENEFIT OF SIGNIFICANTLY REDUCED FUEL CONSUMPTION.

SOLUTION - DETERMINE METHODS AND TECHNIQUES TO REDUCE FABRICATION COSTS FOR ADVANCED HEAT EXCHANGER CORE AND HEADER MATERIALS SUITABLE FOR OPERATING IN ADVANCED GAS TURBINE HIGH TEMPERATURE ENVIRONMENT.



TANK-AUTOMOTIVE COMMAND  
(TACOM)

<u>CATEGORY</u>	<u>PAGE</u>
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## US ARMY TANK-AUTOMOTIVE COMMAND

### (TACOM)

The US Army Tank and Automotive Command is located in Warren, MI, and has the mission of developing, acquiring, and fielding tracked and wheeled military combat, tactical, and general purpose vehicles. The mission is worldwide in scope and includes among its customers all of the US military services, and friendly foreign nations. The production base for mission items is made up of both private and government-owned contractor-operated facilities. MMT efforts are accomplished partially in-house and partially out-of-house. The TACOM MMT program is separated into six categories: armor, general, drive system, track, suspension, and vehicle body.

The main requirements in the field of armor are to increase the ballistic tolerance of conventional armor while reducing its overall weight, and develop new lightweight armor for the high speed, high survivability vehicles which are currently being evaluated in field tests. To meet these requirements, the Command is emphasizing Electro-Slag Remelt (ESR) steel armor and combination type armor to reduce the overall ballistic threat. To pursue these new armor developments, it will be necessary to have commercially available joining processes so that these new armors can be used cost effectively in production. TACOM has established several MMT projects covering joining ESR steel armor, welding complex alloys and shapes by laser, identifying electron beam welding applications, and optimizing both welding procedures and ultrasonic inspection of welds.

The major requirements for propulsion and track are to develop production techniques to manufacture propulsion and drive systems for the M1 and future tracked and non-tracked combat and tactical vehicles. Fabrication and joining are of major concern. TACOM is actively pursuing production development of compliant joints to join metals and non-metals and automated laser machining of complex machine alloys. Life cycle costs for various tactical and combat vehicles can be significantly decreased by eliminating premature failure or extending service life of components by reducing corrosion and deterioration. To support this area, TACOM is endeavoring to bring on line ceramic reinforced combustors.

The track and suspension category is constantly caught in the technical dilemma of producing more advanced systems to meet the ever increasing demands of higher performance in more adverse terrains while maintaining the overall reliability and maintainability of the system at or near current system costs. To achieve these objectives, the track area, as with the other categories, has been sub-divided into major thrust areas for better visibility and management control. These areas



are roadwheels, springs, torsion bar and tube, wheels, rubber pads, and shoes. In these areas the general thrusts have been to introduce production techniques for metal matrix composites, non-metallic matrix composites, advanced rubber compounds, advance elastomeric compounds, lightweight castings, hard surface coatings and powder metallurgy.

In body/frame, the main thrusts are the conservation of fuel and material. To meet these requirements the objective is to reduce the overall weight of the vehicle, to increase its payload, and lower the life cycle cost of the systems by reducing the corrosion and degradation of the materials of construction. Here the main areas of concern are coatings, lightweight/composite structures, miscellaneous components, structural members, and fuel tanks. Within these areas, work will be accomplished in plastic cab tops, maintenance free batteries with high impact resistance, and non-corrosive, lightweight non-structural tactical vehicle components.

TACUM  
C U M M A N O F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY -----	FY82 ----	FY83 ----	FY84 ----	FY85 ----	FY86 ----
ARMUR	5847	11376	6427	8711	1070
BOOY/FRAME	117	975	595	2420	1105
ORIVE SYSTEM	2690	4450	4150	2447	2445
FACTORY MODERNIZATION	100	4700	1500	200	200
GENERAL	2580	2550	0	1050	800
SUSPENSION SYSTEM	327	800	300	925	1100
TRACK	2100	3500	3855	1950	350
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TOTAL	13761	28351	16827	17703	7070

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\* C A T E G O R Y \*  
\*-----\*  
\*ARMOR\*  
\*\*\*\*\*

FUNDING (\$0000)

PRIOR B2 B3 B4 B5 B6

COMPONENT -- GENERAL

(5065) TITLE - ADVANCED TECHNOLOGY SURVEILLANCE COUNTERMEASURES MATERIALS

PROBLEM - USE OF MATERIALS WHICH WILL DEFEAT SURVEILLANCE MEASURES HAS NOT BEEN EXPLOITED IN PRODUCTION.

SOLUTION - PRODUCTION TECHNIQUES ARE NEEDED TO ASSURE SUFFICIENT QUALITY TO PERFORM SATISFACTORILY.

100 250

(5088) TITLE - HIGH-POWER ELECTRON BEAM WELDING IN AIR

PROBLEM - USE OF ELECTRON BEAM HAS NOT BEEN EXPLOITED.

SOLUTION - ESTABLISH PROCESSES UTILIZING THIS NEW PROCESS FOR RAPID ECONOMICAL JOINING OF ARMOR MATERIALS.

45 300

(5094) TITLE - ALLOY AND ARMOR STEELS TREATED WITH RARE EARTH ADDITIVES

PROBLEM - ARMOR STEELS UTILIZED CONVENTIONAL DEOXYGENIZING AND SCAVENGING PROCESSES IN STEEL MAKING.

48 500

SOLUTION - ESTABLISH TECHNIQUES TO TREAT STEELS WITH RARE EARTH ADDITIONS.

(6026) TITLE - POLYMER QUENCHANTS

PROBLEM - THE PRESENT USE OF OIL AS THE QUENCHING MEDIUM IN HEAT TREAT PLANTS INCREASES THE PROBABILITY OF QUENCH FIRES, AND IT EMITS CONSIDERABLE AMOUNTS OF SMOKE AND FUMES.

150

SOLUTION - ESTABLISH THE USE OF WATER-DILUTABLE POLYMERS AS A QUENCHANT TO AVOID FIRE AND POLLUTION PROBLEMS.

(6038) TITLE - HIGH DEPOSITION WELDING PROCESSES FOR ARMOR

PROBLEM - WELDING IS LABOR INTENSIVE AND HIGH COST IT IS A MAJOR COST DRIVER IN ARMOR VEHICLE MANUFACTURE.

1503 700 600 150 150 150

SOLUTION - HIGH DEPOSITION WELDING PROCESSES WILL PERMIT WELDING TO BE ACCOMPLISHED MORE RAPIDLY THUS REDUCING MANPOWER REQUIREMENTS AND INCREASING PRODUCTIVITY.

(6057) TITLE - M-1 COMBAT VEHICLE-MFG TECHNOLOGY

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE XMI CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE XMI TO BE MANUFACTURED MORE ECONOMICALLY.

1155 1795 4998 4585 5000

SOLUTION - IMPROVE PROCESSES FOR XMI MFG. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, BI-CAST HP TURBINE NOZZLES, RSR NICKEL BASE SUPER ALLOYS, MONOCRYSTAL ALLOYS, CERAMIC COMBUSTORS, THERMALLY ASSISTED MACHINING, ETC.

FUNDING (\$000)

PRIOR B2 B3 B4 B5 B6

(CONTINUED)

COMPONENT -- GENERAL

(6059) TITLE - FVS COMBAT VEHICLE-MFG TECHNOLOGY

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.

SOLUTION - IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTENERS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.

B29 2572 352B 1592 3061

COMPONENT -- HULL/BD00Y

(5014) TITLE - FOUNDRY CASTING PROCESSES USING FLUID FLOW + THERM ANALYS

PROBLEM - FOUNDRY CASTING PROCESSES ARE WASTEFUL OF RAW MATERIALS AND ENERGY.

SOLUTION - OPTIMIZE CASTING PROCESSES BY DIGITAL COMPUTER ANALYSIS OF ADVANCED FLUID FLOW AND THERMAL ACTIVITY.

1016 100 300

(5091) TITLE - HEAVY ALUMINUM PLATE FABRICATION

PROBLEM - MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIED CONTOURS AND WELDING THE PIECES TOGETHER REQUIRES A GREAT DEAL OF MANUAL LABOR.

SOLUTION - ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROLS. PROCESS PARAMETERS WILL BE ESTABLISHED FOR HIGH DEPOSITION WELDING PROCESSES.

30 180 300 420

(6053) TITLE - WELDING SYSTEMS INTEGRATION

PROBLEM - OF ALL METAL WORKING PROCESSES EMPLOYED IN TRACKED COMBAT VEHICLES MANUFACTURING, WELDING IS THE MOST LABOR INTENSIVE AND AFTER MACHINING, THE MOST COSTLY. AUTOMATION WHICH COULD REDUCE THESE COSTS IS AS YET AN UNACHIEVED GOAL.

53 500 500 500 500

SOLUTION - UNDERTAKE A COORDINATED PROGRAM TO INTEGRATE EXISTING EXPERTISE AND TECHNOLOGY TO ADDRESS ONE APPLICATION (M1 HULL). EXPERTISE WILL BE IN AREAS OF WELDING PROCESS CONTROL, SENSORY TECHNOLOGY, STRESS ANALYSIS, AND COMPUTER CONTROL.

(6073) TITLE - ADAPTION AND AUTOMATION OF ACOUSTIC EMISSION WELD MONITORING

PROBLEM - IN PROCESSES OF HEAVY WELDING SUCH AS WITH ARMOR, RADIOGRAPHIC INSPECTION METHODS ARE COSTLY AND NOT TOTALLY RELIABLE

SOLUTION - ACOUSTIC SENSORS, USED WITH THE WELDING EQUIPMENT, MONITOR WELD QUALITY AS THE WELD IS MADE. REPAIRS MAY BE MADE IMMEDIATELY.

100

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 \* C A T E G O R Y \*  
 \*-----\*  
 \*BODY/FRAME\*  
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MMT FLVE YEAR PLAN  
 RCS DRGMT 126

FUNDING (\$DOD)

PRIOR 82 83 84 85 86

COMPONENT -- COATING

(5068) TITLE - NEW ANTI-CORROSIVE MATERIALS AND TECHNIQUES

PROBLEM - METALLIC COMPONENTS ARE DETERIORATED BY THE ENVIRONMENT.

SOLUTION - ESTABLISH TECHNIQUES OF ECONOMICALLY APPLYING ANTI-CORROSIVE MATERIAL COATINGS TO THE COMPONENTS OF THE TACTICAL VEHICLE FLEET.

COMPONENT -- COMPOSITE STRUCTURES

(5042) TITLE - MANUFACTURING TECHNIQUES FOR NON-METALLIC TOTAL VEHICLES

PROBLEM - CURRENT VEHICLE COMPONENTS ARE MADE FROM METALS AND ARE EXCESSIVE IN WEIGHT AND TEND TO CORRODE. NEW NON-METALLIC MATERIALS ARE AVAILABLE AND COULD BE ADAPTED.

SOLUTION - VALIDATE FEASIBILITY OF MOLDING VEHICLE COMPONENTS FROM NON-METALLIC MATERIAL USING A MINIMUM OF PARTS AND ESTABLISH PRODUCTION TECHNIQUES.

(6058) TITLE - EXPLOSIVE BONDING OF COMPOSITE MATERIALS

PROBLEM - REQUIREMENTS TO BOND ALTERNATE PLIES OF STEEL AND ALUMINIUM MAY BE MET ONLY BY CUMBERSOME, EXPENSIVE AND SLOW PROCESSES.

SOLUTION - EXPLOSIVE BONDING BONDS STEEL AND ALUMINIUM QUICKLY, RELIABLY, AND CAN BE APPLIED TO ARMOR FABRICATION.

COMPONENT -- FUEL TANKS

(9064) TITLE - LIGHTWEIGHT SADDLE TANK

PROBLEM - FABRICATE AN ECONOMICAL HIGH IMPACT NON-METALLIC FUEL TANK.

SOLUTION - ESTABLISH PROCEDURES AND METHODS TO PRODUCE A LEAK-PROOF FUEL TANK.

COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES

(4001) TITLE - MANUFACTURING FOR CORROSION PREVENTION IN TACTICAL VEHICLES

PROBLEM - CURRENTLY THE ARMY HAS SEVERE CORROSION PROBLEMS WITH ITS TACTICAL TRUCK FLEET. ACHIEVING CORROSION RESISTANCE THROUGH THE APPLICATION OF RUSTPROOFING COMPOUNDS CONTRADICTS THE NBC REQUIREMENT FOR VEHICLES WITH CHEMICAL AGENT RESISTANT COATINGS.

SOLUTION - REINFORCED COMPOSITE MATERIALS CAN REDUCE CORROSION AND WEIGHT AND SIMPLIFY MFG. TECHNOLOGY REQUIREMENTS AND PRODUCTION PARAMETERS FOR VARIOUS COMPONENTS, FROM SMALL PARTS TO COMPLETE TRUCK CABS, WILL BE DETERMINED.

FUNDING (\$DOD)

PRIOR 82 83 84 85 86  
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COMPONENT -- MISC COMPONENTS

(5D19) TITLE - TACTICAL VEHICLE STORAGE BATTERY

4D

PROBLEM - THE MAJOR CAUSE OF TACTICAL VEHICLE BATTERY FAILURE IS BATTERY CONTAINER BREAKAGE.

SOLUTION - PROVIDE NEW HIGH IMPACT PLASTIC CONTAINER TO INCREASE FIELD PERFORMANCE REQUIREMENTS AND TO ACCOMMODATE THE MAINTENANCE FREE CONCEPT ALREADY RELEASED IN LARGER MILITARY BATTERY SIZES.

COMPONENT --- STRUCTURAL MEMBERS

(4579) TITLE - INDUSTRIAL PRACTICES FOR WELDING CONSTRUCTIONAL ALLOY STEELS

10D 100

PROBLEM - A WIDE VARIETY OF HIGH STRENGTH CONSTRUCTIONAL ALLOYS STILL WILL BE USED IN GREATER QUANTITIES TO MEET WEIGHT REQUIREMENTS.

SOLUTION - DOCUMENT RECOMMENDED WELDING PRACTICES AND PROCEDURES TO IDENTIFY SIGNIFICANT FACTORS AFFECTING PRODUCTION QUALITY FOR THE VARIOUS MATERIALS AND EQUIPMENT.

(6067) TITLE - AUTOMATED PROTOTYPE FRAME WELDING

77

PROBLEM - THE WELDING OF SPECIALIZED TRUCK AND TRAILER FRAMES BY THE MANUAL METHOD IS TIME CONSUMING AND COSTLY.

SOLUTION - ESTABLISH A UNIVERSAL FIXTURE THAT WILL USE AUTOMATIC WELDING PROCEDURES.

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\* C A T E G O R Y \*  
\*-----\*  
\*DRIVE SYSTEM \*  
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COMPONENT --- ENGINE

(5D53) TITLE - MANUFACTURE OF ENGINE COMPONENTS OF CERAMIC

50D 500 500 750 750

PROBLEM - FABRICATION OF HIGH EFFICIENCY, HIGH TEMPERATURE DIESEL ENGINES REQUIRES ADVANCED MATERIALS. ENGINES FABRICATED WITH CERAMIC COMPONENTS HAVE BEEN DEMONSTRATED IN R+D BUT MANUFACTURING METHODS FOR SERIAL PRODUCTION COMPONENTS ARE LACKING.

SOLUTION - RECENT RESEARCH EFFORTS INDICATE THAT ENGINE COMPONENTS FROM HIGH STRENGTH STRUCTURAL CERAMICS (SILICON NITRIDE, SILICON CARBIDE) ARE FEASIBLE. THIS EFFORT WILL ESTABLISH QUANTITY PRODUCTION OF CERAMIC COMPONENTS OF CONSISTENT QUALITY.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- ENGINE

(CONTINUED)

(6008) TITLE - AUTOMATED COMPUTER CONTROL LASER MACHINING

PROBLEM - CONVENTIONAL MACHINING OF DIFFICULT TO MACHINE MATERIALS IS VERY EXPENSIVE. RAPID TOOL WEAR AND LOCALIZED HEATING OF THE WORKPIECE IMPACT REMOVAL RATES AND METALLURGICAL CHARACTERISTICS.

SOLUTION - THIS PROGRAM WILL DEVELOP TECHNIQUES FOR LASER MACHINING BY NUMERICAL CONTROL.

250 250

(6018) TITLE - JOINING OF ATTACHMENTS TO CERAMICS

PROBLEM - CURRENT METHOD OF JOINING METALS TO CERAMIC JOINTS ARE NOT RELIABLE AND HAVE POOR LIFE.

SOLUTION - INVESTIGATE USE OF JOINTS THAT ARE COMPLIANT OR USE INTERMEDIATE CONNECTING PHASE.

150 225

(6019) TITLE - GRAIN BOUNDARY IMPROVEMENT PROCESSING FOR CERAMICS

PROBLEM - EFFECT OF HIGH TEMPERATURE ON CERAMICS GRAIN BOUNDARIES LIMIT THEIR APPLICATION.

SOLUTION - UPSCALE DEVELOPED TECHNIQUES FOR DEVELOPING A NONGLASS BOUNDARY OR ELIMINATE THE GRAIN BOUNDARY PHASE.

120 220

(6028) TITLE - PRODUCTION QUALITY CONTROL BY AUTO INSPECTION EQUIPMENT(CAM)

PROBLEM - THE INCREASED COMPLEXITY OF COMBAT VEHICLES HAS RESULTED IN EXCESSIVE TIME AND HIGH SKILL LEVEL REQUIREMENTS FOR INSPECTION AND TEST.

SOLUTION - DEVELOP AUTOMATED DIAGNOSTIC EQUIPMENT TO REDUCE TIME AND LOWER SKILL REQUIREMENTS. AUTOTESTING OF WIRING HARNESSSES AND ENGINES WILL BE ACCOMPLISHED. AUTOMATION OF INSPECTION RECORDS WILL BE ACCOMPLISHED.

60

247

(6079) TITLE - AGT-1500 ENGINE

PROBLEM - THE NEED TO REDUCE COST AND IMPROVE PERFORMANCE OF THE AGT-1500 TURBINE ENGINE REQUIRES NEWER AND MORE INNOVATIVE MANUFACTURING TECHNOLOGY.

SOLUTION - INCORPORATE NEW PROCESSES AND TECHNOLOGY INTO THE AGT-1500 MANUFACTURING METHODS.

1360 3400 3400 1180 2000

COMPONENT -- TRANSMISSION

(5005) TITLE - COLD FORGED GEARS TO DRAWING TOLERANCES

PROBLEM - MACHINING AND OTHER PROCESSES ADD COST TO THE FINISHED COMPONENT.

SOLUTION - ESTABLISH A MFG PROCESS TO RESULT IN A FINISHED GEAR TO DRAWING TOLERANCES FROM BAR STOCK AT AMBIENT TEMPERATURES.

300 300



FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- TRANSMISSION

(CONTINUED)

404 250

(5024) TITLE - GEAR DIE DESIGN AND MFG UTILIZING COMPUTER TECHNOLOGY (CAM)

PROBLEM - THE CONTROL OF DIMENSIONAL TOLERANCES OF FORGED BEVEL GEARS PRESENTS A UNIQUE PROBLEM SINCE THESE GEARS ARE NOT MFG. TO THEORETICAL EQUATIONS. THE BEVEL GEAR IS NOT DEFINED DIMENSIONALLY BUT IS PRESENTED AS REQUIREMENTS FOR TOOTH BEARING PATTERNS.

SOLUTION - THIS PROGRAM WILL ELIMINATE THE CURRENT TRIAL AND ERROR METHODS BY UTILIZING CAD/CAM METHODS AND INTERACTIVE GRAPHICS TECHNIQUES. EXCESSIVE SCRAP, UNEXPECTED DIE WEAR AND BREAKAGE, AND THE HIGH COST OF FURGING DIES WILL BE ADDRESSED.

834 30

(5083) TITLE - UPSCALING OF ADVANCED POWDER METALLURGY PROCESSES

PROBLEM - POWDER METALS PROCESSES HAVE NOT BEEN UTILIZED IN LARGE COMPONENTS

SOLUTION - TEST PROCESSES WHICH PRODUCE HIGH DENSITY HIGH STRENGTH LARGE COMPLEX SHAPES.

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\* C A T E G O R Y \*  
\*-----\*  
\*FACTORY MODERNIZATION\*  
\*\*\*\*\*

COMPONENT -- MISCELLANEOUS

1DD 15DD

(6089) TITLE - ABRAMS TANK PRODUCTIVITY IMPROVEMENT (PHASE I)

PROBLEM - LIMA TANK PLANT, PRESENTLY THE ONLY ABRAMS TANK PRODUCING FACILITY, HAS PROBLEMS WITH EQUIP, FIXTURING, PROCESSING, INSPECT TECHNIQUES RESULTING IN EXCESSIVE MANUF. COSTS, LOW DELIVERY SCHEDULES. WARREN PLANT WILL BE USED FOR ABRAMS AROUND MID80 S.

SOLUTION - ANALYZE LIMA, WARREN TANK PLANTS FOCUSING ON PRODUCTIVITY, COST SAVINGS, MODERNIZATION. DEVELOP A MFG ENVIRON. IMPL PLAN TO REDUCE COSTS TO ARMY, IMPROVE PRODUCTIVITY, INSURE TIMELY DELIVERIES.

1DD 1500 1000

(6090) TITLE - TOOLE ARMY DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM

PROBLEM - THE AGING FACILITY AND OUTDATED TECHNIQUES HAVE RESULTED IN AN INEFFICIENT OPERATION AND SLOW DELIVERIES.

SOLUTION - DEVELOP AND DEFINE AN ENVIRONMENT AND IMPLEMENTATION PLAN TO IMPROVE PRODUCTIVITY, REDUCE REFURBISHING COSTS TO THE ARMY, AND INSURE TIMELY DELIVERY.

FUNDING (\$0000)

PRIOR 82 83 84 85 86

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(6095) TITLE - ABRAMS TRANSMISSION PRODUCTIVITY IMPROVEMENTS

PROBLEM - A NUMBER OF TECHNOLOGICAL AREAS HAVE BEEN IDENTIFIED WHICH CAN BE APPLIED AS COST REDUCING MEASURES OR AS A MEANS OF IMPROVING THE MANUFACTURE COST OF THE M1 ABRAM TRANSMISSION.

SOLUTION - THE TECHNOLOGICAL AREAS WILL BE SEPARATED INTO 4 TASKS. A FINAL REPORT WILL BE GENERATED FOR EACH TASK ALONG WITH PILOT HARDWARE AND/OR CHANGES TO THE TECHNICAL DATA PACKAGE AS APPROPRIATE TO ACCOMMODATE IMPLEMENTATION.

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\* C A T E G O R Y \*  
\*-----\*  
\*GENERAL \*  
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COMPONENT -- MISCELLANEOUS

(5082) TITLE - FLEXIBLE MACHINING SYSTEM PILOT LINE FOR TCM COMPONENT

PROBLEM - PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER PDN COSTS ARE NOT USED.

SOLUTION - THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.

(5090) TITLE - IMPROVED AND MOST EFFECTIVE MACHINING TECHNOLOGY

PROBLEM - MACHINE DATA ON NEWER MATERIALS AND NEW REMOVAL RATES ARE NOT ESTABLISHED.

SOLUTION - ESTABLISH DATA WHEREAS THE NEW MACHINING EQUIPMENT MAY BE UTILIZED WITH MAXIMUM EFFICIENCY.

(5093) TITLE - MANUFACTURING METHODS FOR HIGH SPEED MACHINING FERROUS ALLOY

PROBLEM - FAST CHIP REMOVAL FOR ALUMINUM ALLOYS HAVE NOT BEEN ESTABLISHED FOR PRODUCTION.

SOLUTION - ESTABLISH FAST CHIP REMOVAL FOR PRODUCTION CONDITIONS.

(6025) TITLE - MANUFACTURING LASER FACILITY

PROBLEM - THE FEASIBILITY OF USING LASERS FOR METAL PROCESSING IS ESTABLISHED. IMPLEMENTATION IS IMPEDED BY THE COST OF FACILITIZATION.

SOLUTION - ESTABLISH A FACILITY TO IMPLEMENT LASER TECHNOLOGY IN PRODUCTION.

2540 750 750

714 250 350

550 550 500

1080 400

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(6054) TITLE - ADVANCED METROLOGY SYSTEMS INTEGRATION

50 500 500 500 300

PROBLEM - THE METROLOGY METHODS USED IN MILITARY VEHICLE MANUFACTURE, IN GENERAL, EMPLOYS CONTACT GAUGES MANUALLY EMPLOYED. THIS REPRESENTS A SUBSTANTIAL PART OF THE COST OF OUR MILITARY VEHICLES.

SOLUTION - NON-CONTACT, IN-PROCESS GAUGING (ELECTRO-OPTICAL AND LASER) WILL BE ADAPTED TO A VEHICLE MACHINING OPERATION. SOLID PHOTOGRAPHY WILL BE ADAPTED TO MEET THE MEASURING REQUIREMENTS OF COMPONENTS SUCH AS TURBINE BLADES.

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\* C A T E G O R Y \*  
\*-----\*  
\*SUSPENSION SYSTEM \*  
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COMPONENT -- ROAD WHEELS

(4559) TITLE - PRESSURE CASTING TECHNIQUES FOR ALUMINUM COMPONENTS

250

PROBLEM - ALUMINUM CASTINGS REQUIRE GATINGS AND RISERS WHICH UTILIZE LARGE AMOUNTS OF MATERIAL WHICH HAVE TO BE REMOVED FROM THE CASTINGS AND USED AS SCRAP REHEAT. THIS CONTRIBUTES TO INCREASED COSTS OF COST ITEMS.

SOLUTION - ESTABLISH MANUFACTURING PROCESSES UTILIZING LOW PRESSURE CASTING TECHNIQUES, THEREBY ELIMINATING THE NEED FOR EXCESS GATING AND TOTALLY ELIMINATING RISERS.

COMPONENT -- SPRINGS

(6011) TITLE - SPRINGS FROM CARBON-FIBER PLASTIC-COMPOSITES

115 250 250

PROBLEM - STEEL SPRINGS FOR TACTICAL VEHICLES ARE HEAVY AND SUBJECT TO FAILURE FROM FATIGUE. CARBON FIBER COMPOSITES ARE LIGHTER AND HAVE EXCELLENT FATIGUE RESISTANCE.

SOLUTION - THE TECHNOLOGY IS KNOWN TO MANUFACTURE LEAF SPRINGS FROM CARBON-FIBER PLASTIC COMPOSITES, HOWEVER THE TECHNIQUES FOR MASS PRODUCTION NEED TO BE DEVELOPED.

COMPONENT -- TORSION BAR/TUBE

(5002) TITLE - FABRICATING TORSION BAR SPRINGS FROM HIGH STRENGTH STEEL

150 77

PROBLEM - ENGINEERING ALLOY STEELS CAN BE HEAT TREATED TO A MAXIMUM WORKING HARDNESS WHICH REQUIRES LARGE DIAMETER BARS THEREBY INTERFERING WITH DESIGN FITS AND INCREASING WEIGHT.

SOLUTION - ESTABLISH METHODS OF FABRICATING TORSION BARS UTILIZING 300000 MINIMUM YIELD MATERIALS.

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- TORSION BAR/TUBE

(CONTINUED)

(5074) TITLE - PRODUCTION TECHNIQUES FOR COMBAT VEHICLE SUSPENSION SYSTEMS

PROBLEM - SUSPENSION SYSTEMS OF COMBAT VEHICLES ARE UNDERGOING A LARGE DESIGN CHANGE TO PROVIDE INCREASED MOBILITY PERFORMANCE BY UTILIZING NEWLY DEVELOPED COMPONENTS. APPLICATION OF THE ADVANCED SYSTEMS WILL INCREASE ACQUISITION COSTS.

SOLUTION - APPLY ADVANCED MANUFACTURING TECHNIQUES TO REDUCE OR PREVENT INCREASES IN THE ACQUISITION COSTS.

400 500

(6029) TITLE - MANUFACTURING PROCESS FOR METAL MATRIX COMPOSITES

PROBLEM - METAL MATRIX COMPOSITES MAKE POSSIBLE COMPONENTS HAVING REDUCED WEIGHT AND INCREASED STRENGTH THE MANUFACTURING METHODS FOR PRODUCTION MUST BE DEVELOPED BY UPSCALING LAB METHODS.

SOLUTION - UPSCALE AND OPTIMIZE MANUFACTURING METHODS.

300 300 300 300

COMPONENT -- WHEELS

(5038) TITLE - NON-PNEUMATIC COMBAT TIRE FABRICATION TECHNIQUES

PROBLEM - PNEUMATIC TIRES ON TACTICAL VEHICLES ARE SUBJECT TO COMBAT DAMAGE.

SOLUTION - ESTABLISH PROCESSING TECHNIQUES TO ASSURE RELIABLE HIGH MOBILITY, NON-PNEUMATIC TIRES.

225 300

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\* C A T E G O R Y \*  
\*-----\*  
\* TRACK \*  
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COMPONENT -- RUBBER PADS

(4264) TITLE - INSERTS AND FRICTION FILLERS FOR TRACK RUBBER PADS

PROBLEM - TRACK PADS LUT AND CHUNK IN ROCKY OR FROZEN GROUND RESULTING IN REDUCED PAD LIFE AND INCREASED COSTS AND MAINTENANCE.

SOLUTION - ESTABLISH PROCESS TO INCORPORATE FILLER FRICTION MATERIALS IN EXISTING FORMULATIONS WHICH WILL REDUCE CUTTING AND CHUCKING.

520 250

(5075) TITLE - RUBBER FOR MILITARY TRACK

PROBLEM - TRACK LIFE IS HELD AT ITS PRESENT LEVEL BY FAILURE OF RUBBER COMPONENTS SUCH AS BUSHINGS, PADS AND BLOCKS.

SOLUTION - ESTABLISH PRODUCTION PROCESSES FOR NEWLY DEVELOPED ELASTOMER COMPOUNDS FOR TRACKS.

200 200

MMT FIVE YEAR PLAN  
RCS DRCMT 126

FUNDING (\$000)

PRIOR	82	83	84	85	86
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COMPONENT --- SHOES

(4513) TITLE - HIGH DENSITY POWDER METAL PARTS FOR COMBAT VEHICLES

PROBLEM - TRACK COMPONENTS WEAR EXCESSIVELY REQUIRING THE TRACK TO BE ADJUSTED AND/OR REPLACED FREQUENTLY.

SOLUTION - FABRICATE COMPONENTS BY COMPACTING HIGH WEAR ALLOYS FROM POWDER.

175 200

(4514) TITLE - HARD FACING OF TRACK SHOES

PROBLEM - NO DEFINITE PROCEDURE AND HARD FACING MATERIALS HAVE BEEN ESTABLISHED AS THE MOST SATISFACTORY REPAIR COMBINATION FOR TRACK SHOES. PRIOR EFFORTS HAVE BEEN MADE IN BOTH THE USA AND EUROPE BUT NOTHING DEFINITE HAS RESULTED.

150 150

SOLUTION - THE TRACK SHOE GROUSERS WILL BE BUILT UP BY DEPOSITION USING A HARD FACING PROCESS. THE PROCESS WILL BE AUTOMATED AND TOOLING WILL BE DESIGNED TO ALLOW THE EQUIPMENT TO FOLLOW THE CONTOURS OF THE TRACK SHOE GROUSERS.

(5054) TITLE - LASER SURFACE HARDENING COMBAT VEHICLE COMPONENTS

475 175

PROBLEM - PRESENT METHODS OF SURFACE HARDENING INPUTS HEAT OVER LARGE SURFACE AREA.

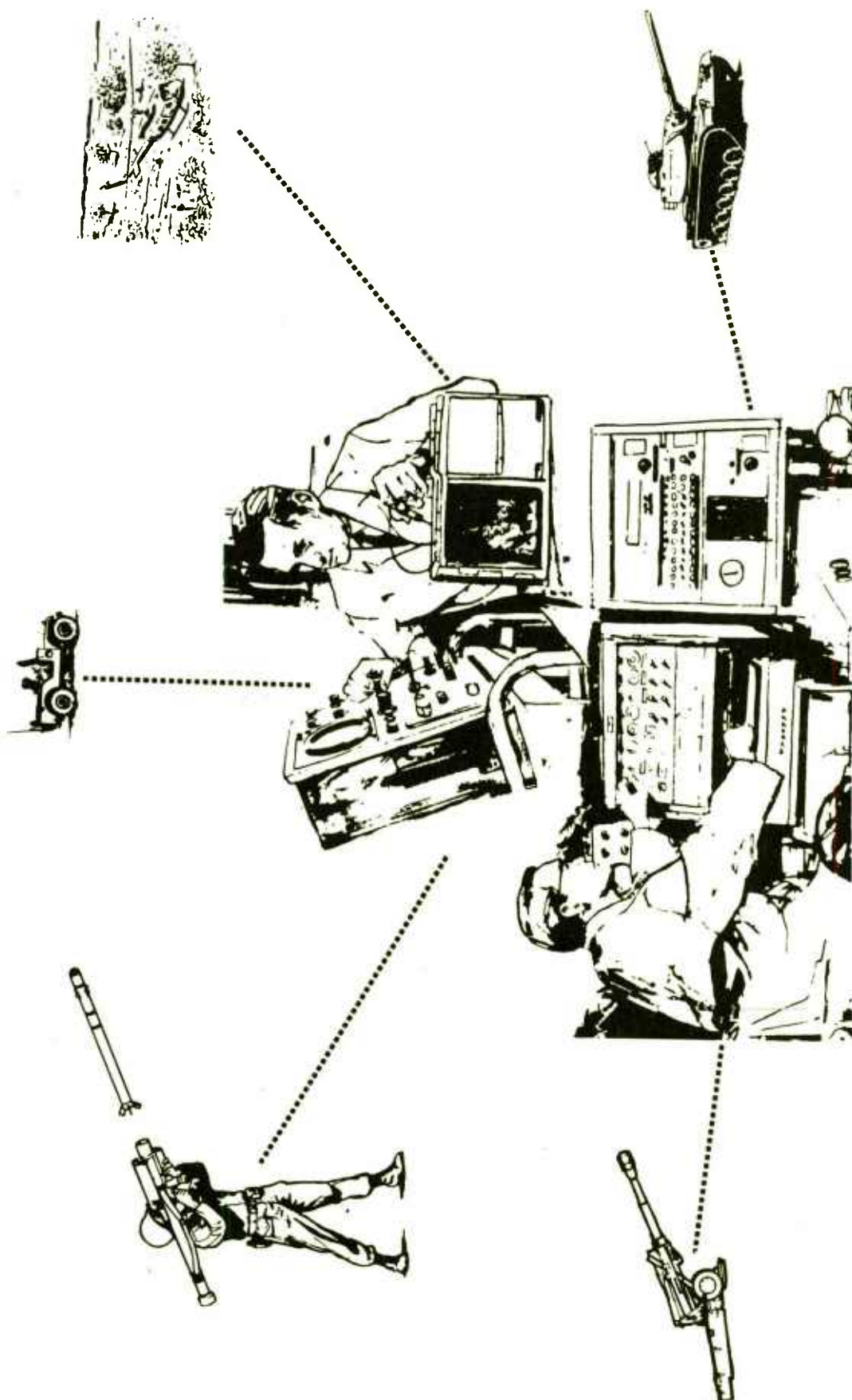
SOLUTION - ESTABLISH LASER BEAM HARDENING PROCEDURES WITH ITS ATTENDANT FINE BEAM SMALL AREAS RAPID HEATING.

(6107) TITLE - IMPROVED MBT TRACK

1725 3250 3855 1625

PROBLEM - INCREASED VEHICLE PERFORMANCE REQUIREMENTS NECESSITATE HIGHER PERFORMANCE TRACKS THAN THOSE AVAILABLE TODAY. TO IMPLEMENT NEW METAL COMPOSITE, HIGHER STRENGTH FERROUS ALLOYS, AND TITANIUM NEW MANUFACTURING PROCESSES MUST BE ESTABLISHED.

SOLUTION - TO IMPLEMENT NEW MATERIAL TRACK SHOES AND PINS, INVESTMENT CASTING AND HOT MOLDING TECHNIQUES WILL BE ESTABLISHED FOR METAL MATRIX COMPOSITES.



## TEST AND EVALUATION COMMAND (TECOM)

<u>CATEGORY</u>	<u>PAGE</u>
Testing -----	219



## US ARMY TEST AND EVALUATION COMMAND

### (TECOM)

TECOM, with headquarters at Aberdeen Proving Ground, MD, is the primary developmental testing agency for the US Army. TECOM plans, conducts, and reports on development tests performed during the life cycle of Army materiel, and evaluates foreign materiel for possible US acquisition. Additional testing is performed as a service to the commodity commands upon their request. The testing organization consists of the aircraft development test activity, three environmental testing activities, five proving grounds (one of which serves as the third environmental activity), and a national missile range. Facilities are located in the continental United States, the Panama Canal Zone and Alaska.

Individual investigations into production test procedures and evaluation techniques are accomplished through TECOM's MMT program. In view of TECOM's mission and the intended results of the MMT efforts (to improve test procedures), the majority of the work is accomplished in-house.

TECOM's MMT efforts are grouped under two general headings: documentation and resource conservation. Individual efforts are funded from these "parent programs." Current funding constrains TECOM to an annual program that supports approximately one-half of their planned efforts.

TECOM  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY	FY82	FY83	FY84	FY85	FY86
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TESTING	482	1200	1400	1500	1600
	----	----	----	----	----
TOTAL	482	1200	1400	1500	1600

MMT FIVE YEAR PLAN  
RCS DRCMT 126

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\* TESTING \*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR 82 83 84 85 86  
-----

COMPONENT --- DOCUMENTATION

(5072) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

181 452 525 565 600

PROBLEM - STANDARD TEST PROCEDURES ARE REQUIRED TO INSURE THAT TEST ACTIVITIES COLLECT DATA AND CONDUCT TESTS IN A UNIFORM MANNER TO SUPPORT THE DT EVALUATION PROCESS. ACCEPTANCE TEST PROCEDURES ARE REQUIRED TO VERIFY PRN HARDWARE SPECIFICATION COMPLIANCE.

SOLUTION - MAINTAIN TEST OPERATIONS PROCEDURES AND ACCEPTANCE TEST PROCEDURES TO TEST SYSTEMS FOR SPECIFICATION COMPLIANCE.

COMPONENT --- RESOURCE CONSERVATION

(5071) TITLE - TECOM PRODUCTION METHODOLOGY ENGINEERING MEASURES

5680 217 540 630 675 720

PROBLEM - ARTILLERY, VEHICLE AND ELECTRONIC CONVENTIONAL TEST CAPABILITIES NEED TO BE UPGRADED TO PROVIDE MORE TIMELY ACCURATE TEST DATA FOR THE TEST AND EVALUATION PROCESS.

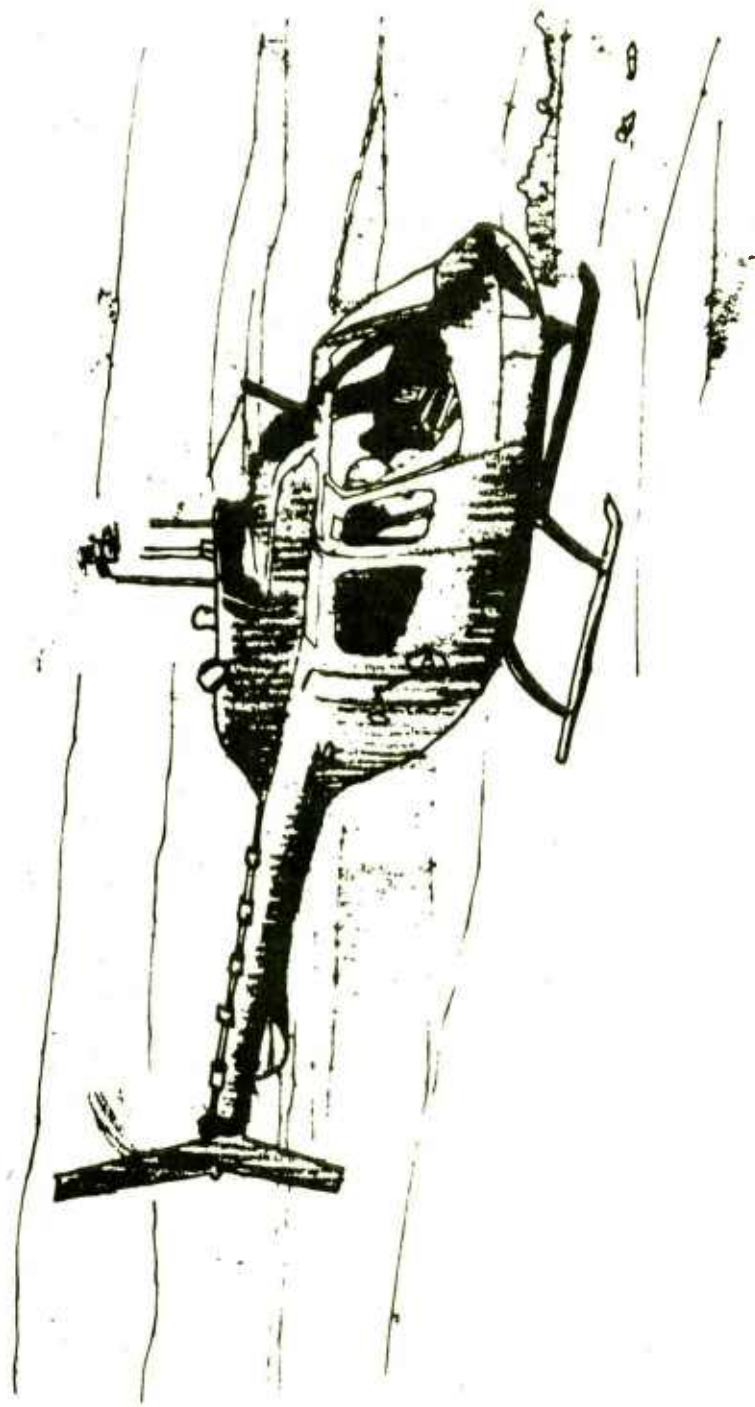
SOLUTION - DEVELOP A PROGRAM TO UPGRADE CONVENTIONAL TEST CAPABILITIES AT THE TEST ACTIVITIES.

(5073) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

84 208 245 260 280

PROBLEM - FIELD TESTING COMPLEX WEAPON SYSTEMS IS COST PROHIBITIVE. SIM TECHNIQUES MUST BE DEVELOPED TO REDUCE THE COST AND MANPOWER REQUIRED TO PERFORM GUNT TESTS ROUTINE. PUN TEST PROCESSES MUST BE AUTOMATED BECAUSE OF PERSONNEL REDUCTIONS AT TEST ACTIVITIES

SOLUTION - DEVELOP SIMULATION TECHNIQUES TO TEST COMPLEX WEAPON SYSTEMS AND AUTOMATE PRODUCTION TEST PROCESSES.



**TROOP SUPPORT AND AVIATION  
MATERIEL READINESS COMMAND  
(TSARCOM)**

<u>CATEGORY</u>	<u>PAGE</u>
Factory Modernization -----	225
Turbine Engine -----	225

## US ARMY TROOP SUPPORT AND AVIATION MATERIEL READINESS COMMAND

### (TSARCOM)

The US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) was established on 1 July 1977 in St. Louis, Missouri. TSARCOM's mission is to provide positive readiness support for 23 major categories of equipment to the entire Department of Defense and 80 foreign countries. The diverse mission ranges from fixed-wing and rotary-wing aircraft to a fleet of amphibians and watercraft, and field support items such as generators, bridges, water purifiers, camouflage, mine detectors, air conditioners and heaters, fuel storage and distribution equipment, compasses and surveying instruments.

The focal point of TSARCOM's technology effort is the manufacturing facilities for turbine engines. Stratford Army Engine Plant, operated by AVCO-Lycoming, is the subject of the Army's first factory modernization effort. The goal is to reduce the costs of the T-53, T-55, and AGT-1500 engines by modernizing the plant's management systems, manufacturing methods, processes, production equipment, and computer aided manufacturing systems.

TSARCOM  
C O M M A N D F U N D I N G S U M M A R Y  
(THOUSANDS)

CATEGORY -----	FY82 ----	FY83 ----	FY84 ----	FY85 ----	FY86 ----
FACTORY MODERNIZATION	3000	6300	0	0	0
TURBINE ENGINE	486 ----	0 ----	0 ----	0 ----	0 ----
TOTAL	3486	8300	0	0	0



MMT FIVE YEAR PLAN  
RCS DRCMT 126

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*FACTORY MODERNIZATION\*  
\*\*\*\*\*

FUNDING (\$000)

PRIOR 82 83 84 85 86

COMPONENT -- GENERAL

(8192) TITLE - TURBINE ENGINE PRODUCTIVITY IMPROVEMENT

1725 3000 8300

PROBLEM - THE STRATFORD ARMY ENGINE PLANT (SAEP) IS IN NEED OF MODERNIZATION. BOTH THE PLANT AND NEARLY 50 PERCENT OF TE EQUIPMENT IS OVER 25 YEARS OLD. A COMBINATION OF AGING MFG FACILITIES, METHODS, PROCESSES, ETC., HAVE RESULTED IN EXCESSIVE MFG COSTS.

SOLUTION - THE THRUST OF THIS PROJECT IS TO ANALYZE THE ENTIRE SAEP FACILITY WITH A FOCUS ON PRODUCTIVITY, COST SAVINGS AND PLANT MODERNIZATION. AREAS TO BE EVALUATED INCLUDE BOTH MGT AND BUSINESS SYSTEMS EG. MFG METHODS, PROCESSES, EQUIP, FACILITIES, AND CAM

\*\*\*\*\*  
\* C A T E G O R Y \*  
\*-----\*  
\*TURBINE ENGINE\*  
\*\*\*\*\*

COMPONENT -- TURBINE BLADES

(8190) TITLE - IMPROV CUTTER LIFE, T-700 COMP BLISK/IMPELLER MILLING OPER

225 486

PROBLEM - MILLING CUTTER COST ASSOCIATED WITH THE BLISK AND IMPELLER FOR THE T-700 ENGINE IS AVERAGE \$2540 PER ENGINE AND IS CONSIDERED EXCESSIVELY HIGH.

SOLUTION - INVESTIGATE CUTTER PARAMETERS WHICH AFFECT CUTTER LIFE, SUCH AS FEEDS, SPEEDS, GEOMETRY, AND CUTTING FLUIDS AND THEREBY DEVELOP A MANUFACTURING TECHNOLOGY TO REDUCE CUTTER COSTS BY 50 PERCENT.

## APPENDICES

## INDUSTRY GUIDE

This section of the MMT Program Plan explains the Army programming cycle for the MMT Program. The objective of the MMT Program is to develop new manufacturing methods and processes that will reduce the cost of producing weapon systems. The program consists of approximately 200 projects annually that concentrate on improving and/or developing manufacturing methods, techniques and processes.

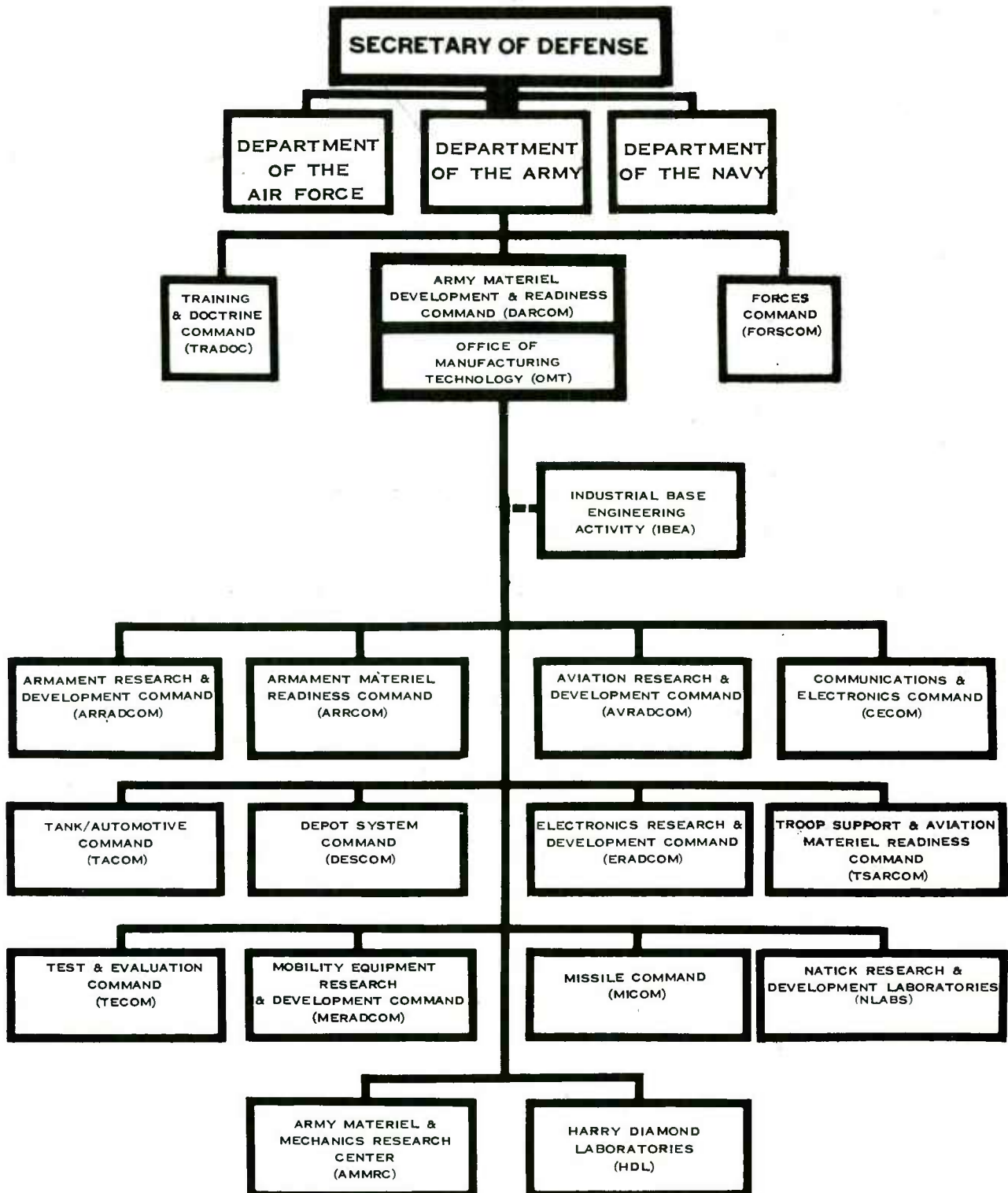
Within the Army, the Directorate for Manufacturing Technology (DMT) has been established to provide overall program responsibility. Functional responsibility is at the commodity oriented, Major Subcommands (SUBMACOM'S). The SUBMACOM'S plan, formulate, budget, and execute individual projects. The Industrial Base Engineering Activity (IBEA) assists DMT on the technical aspects of the Manufacturing Technology Program. The organizational chart on the next page depicts this supporting framework.

Throughout the Program Plan reference is made to various appropriations. These appropriations are identified in the Army Management Structure (AR 37-100-FY) and are established by the US Congress as a standard accounting system. Most MMT efforts are funded through the Procurement Appropriations which include (1) Aircraft, (2) Missile, (3) Weapons and Tracked Combat Vehicles, (4) Ammunition, and (5) Other. A few projects receive funds from the Operations Maintenance, Army (OMA) appropriation.

Identification of manufacturing problems is the first step in developing an MMT Program. Problem areas are conceptualized and compiled into a planning document (the Program Plan). At the date of the publication, the Program Plan contains one funded year, two programmed years and two planned years. As the program cycle proceeds the concepts are refined and project proposals are developed. A diagram depicting this programming cycle is shown on page A-3. To fully understand the entire programming cycle one must realize that DOD budgets on a Fiscal Year (FY). The FY starts on 1 October and ends the last day of the following September. For example, on 1 October 1982, the Army will begin the first quarter of FY83.

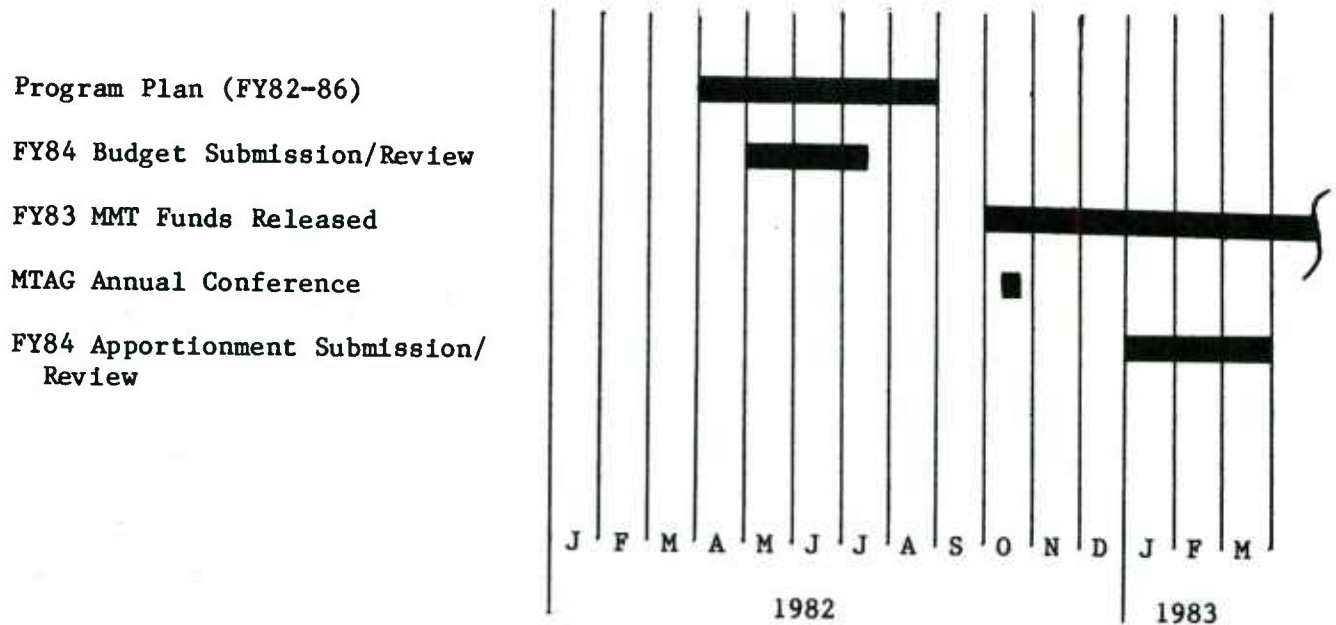
The following programming cycle chart depicts the various activities and stages that MMT projects go through. Concepts are first identified in the five year plan according to the projected year funding is expected. Each year these concepts are reevaluated and move forward until they reach the budget phase. Industry has the opportunity to participate in the evaluation of these projects by voicing comments during the annual MTAG conference. At this gathering the current program, the latest budget project and the Program Plan are discussed.

# UNITED STATES ARMY MATERIEL DEVELOPMENT & READINESS COMMAND (DARCOM)



Calender Year Activities  
MMT Planning/Budgeting/Review Cycle

YEARLY ACTIVITIES



The programming cycle shown above starts with the Program Plan. This document consolidates individual submissions from the SUBMACOM'S and develops the planned program. Because Army budget guidance provides "ceilings," potential projects must be prioritized which results in some being excluded or slipped. Inclusion in the Plan does not guarantee that the project will be funded. The level of funding is dependent upon Congressional appropriations.

As projects approach the start of the funding cycle specific objectives and work scopes are developed. These projects are documented in what is known as a P-16. A P-16 is simply the format that is utilized to document data elements such as estimated cost, economics, and description of work. (The P-16 format is described in AR 700-90).

The budget submission represents the first P-16 submitted for inclusion in the program. This submission is followed about nine months later by the more definite apportionment submission. Projects are then funded when the new fiscal year begins. Although this is the normal planning cycle, a project can enter the planning cycle at any point in time. Such a project would be known as a late start submission and funding is usually at the expense of another project.

Criteria for funding individual projects include technical, operational, and economical feasibility. Evaluation includes the potential for technical success, the means by which the results will be implemented, the potential payback or return on investment and the interrelationships that exist between these factors.

For a more comprehensive understanding of the MMT program, the following list of documents is provided for reference:

DOD Instruction 4200.15, Manufacturing Technology Program

AR 700-90, The Army Industrial Preparedness Program

AR 37-100, The Army Management Structure

AR 11-28, Economic Analysis and Program Evaluation for Resources Management

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